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Electrical
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Ideas



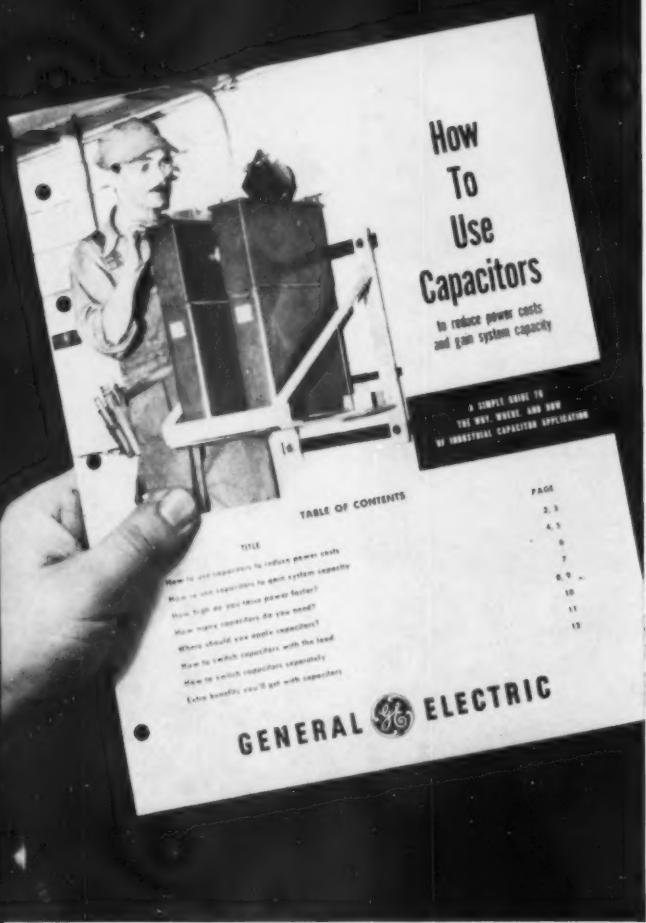
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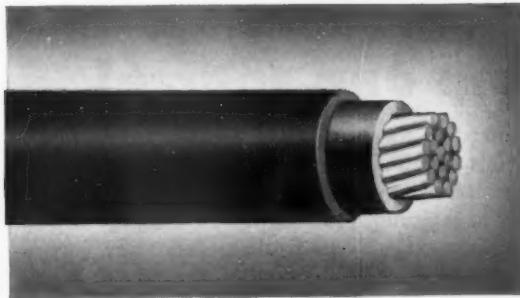
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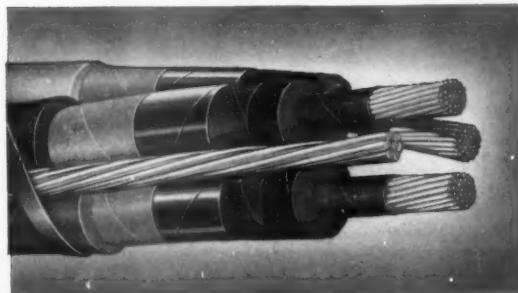
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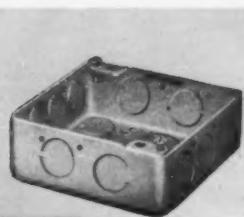
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with which is consolidated Electrical Contracting, The
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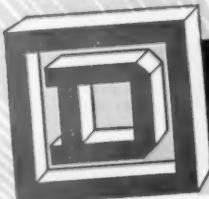
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RS Series
Junction Condulets take
detachable hub plates
with 1, 2, or 3 hubs
for conduit from
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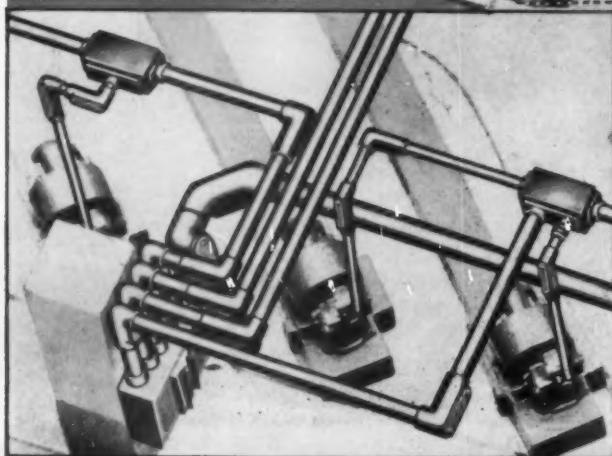
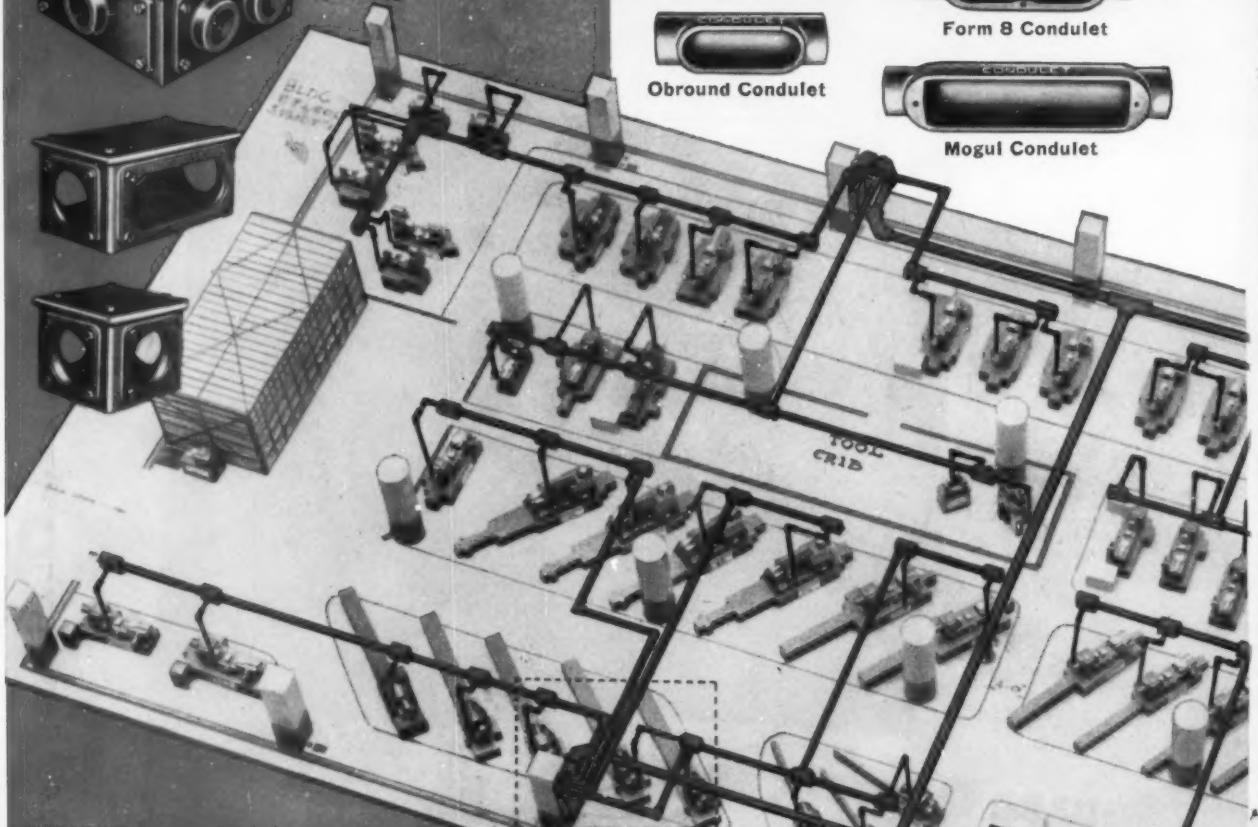
Obround Condulet



Form 8 Condulet



Mogul Condulet

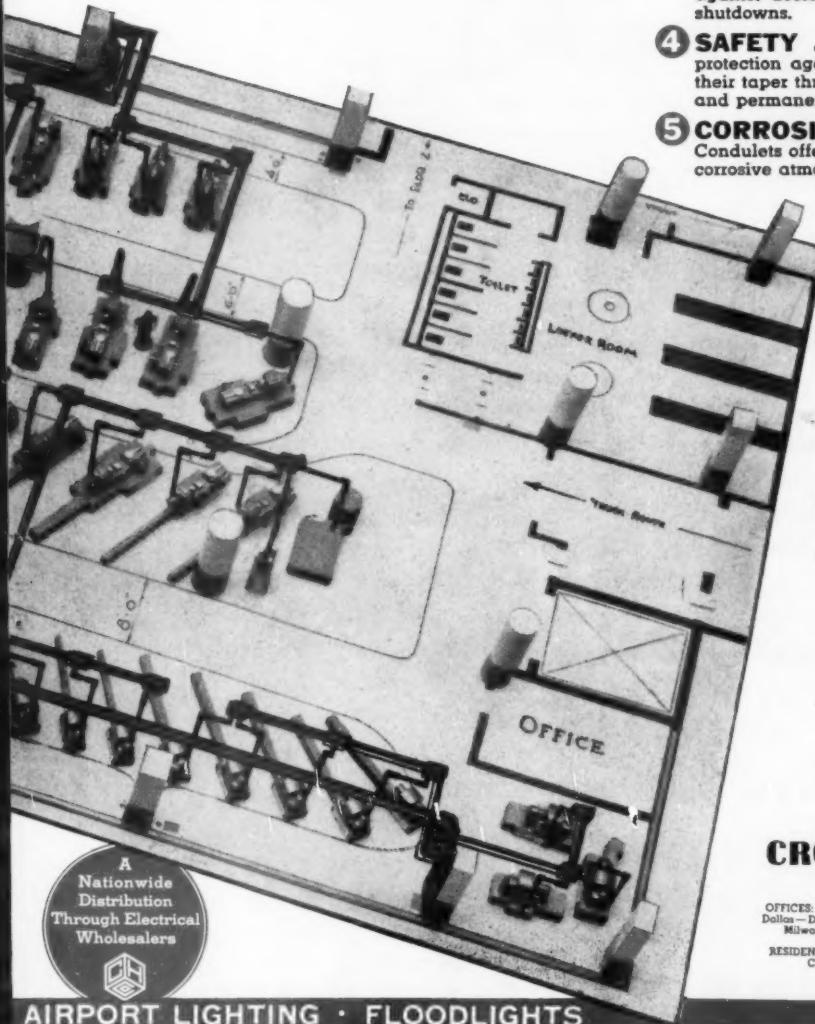


Enlarged view, showing how
Type RSM Condulets provide for
easy expansion... branch circuits
can be added at any time. Simply
replace a blank plate with a plate
that has the required number and
size of hubs.

CONDULETS • TRAFFIC SIGNALS

conduit method gives YOU definite advantages !

The photograph below shows a model of an actual installation in a screw machine department. It is an outstanding example of a layout that meets modern industry's need for flexibility, while retaining the enduring protection and safety that can only be given by cast Condulets and rigid conduit.





1 FLEXIBILITY . . . A modern Condulet installation, like the one illustrated below, provides for the vigorous growth and changing conditions of a modern industry. The RS Series Condulets with their detachable hub plates make it easy to change circuits or add additional circuits at any time.

2 UNIVERSAL APPLICATION . . . Galvanized Condulets and galvanized rigid conduit may be used under all atmospheric conditions and occupancies.

3 MECHANICAL PROTECTION . . . Cast Feraleoy Condulets and rigid conduit provide the best possible protection against accidental damage to the wiring — prevents costly shutdowns.

4 SAFETY . . . A Condulet installation gives maximum protection against personal injury and fires. Condulets with their taper threaded hubs and rigid conduit provide a reliable and permanent low resistance path to ground.

5 CORROSION RESISTING . . . Cast Feraleoy Condulets offer the best protection wherever moisture, dust or corrosive atmospheres are present.

6 ECONOMY . . . Direct comparison of Condulet and rigid circuit installations with other wiring methods show comparable installed costs. The durability, safety, and low maintenance cost of Condulet installations produces savings which pay dividends over the years.

7 QUALITY . . . All Condulets are built to Crouse-Hinds' high standard of quality with painstaking care by skilled craftsmen. Thousands of Condulet installations that are still in active service after twenty, thirty, forty or more years offer positive proof that the trademark CONDULET stands for reliability and long life.

8 VARIETY . . . Thousands of types and sizes of Condulets, plugs and receptacles, and lighting fixtures are listed in the Condulet Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations. There is a Condulet for every purpose.

***CONDULET** is a coined word registered in the U. S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

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AIRPORT LIGHTING • FLOODLIGHTS

IF YOU SPECIFY OR BUY FLUORESCENT FIXTURES:

Here is why General Electric believes you should insist on series ballasts for 96T12 lamps

Several years ago, our engineers studied the merits of the series-type ballast circuit for operating the 96T12 lamp at 425 ma. It showed real possibilities for economy, both in ballast cost and size. With concentrated efforts, a series ballast design for this lamp was perfected. Then for the first time, a series-type ballast circuit meeting all lamp requirements and giving full rated lamp life was made available to you.

Actually, there was nothing basically new about the series-type ballast. As early as 1940, our engineers had studied such a circuit. As new lamps were made available over the years, the series ballast was investigated time and again. However, prior to the 96T12 lamp, the potential savings of the series ballast circuit had been discarded because no way had been found to meet lamp operating requirements.

During those years the lead-lag ballasting circuit was widely used for the various types of lamps then available. Naturally, this type of ballast gained wide acceptance in the lighting industry as the standard of ballast quality.

After the 96T12 lamp was introduced, a series ballast was developed which proved to be the best ballasting tool for this important new lamp. However, there was real hesitancy about accepting a series

ballast for the 96T12 because in the past, a lead-lag ballast had been found superior for other lamps.

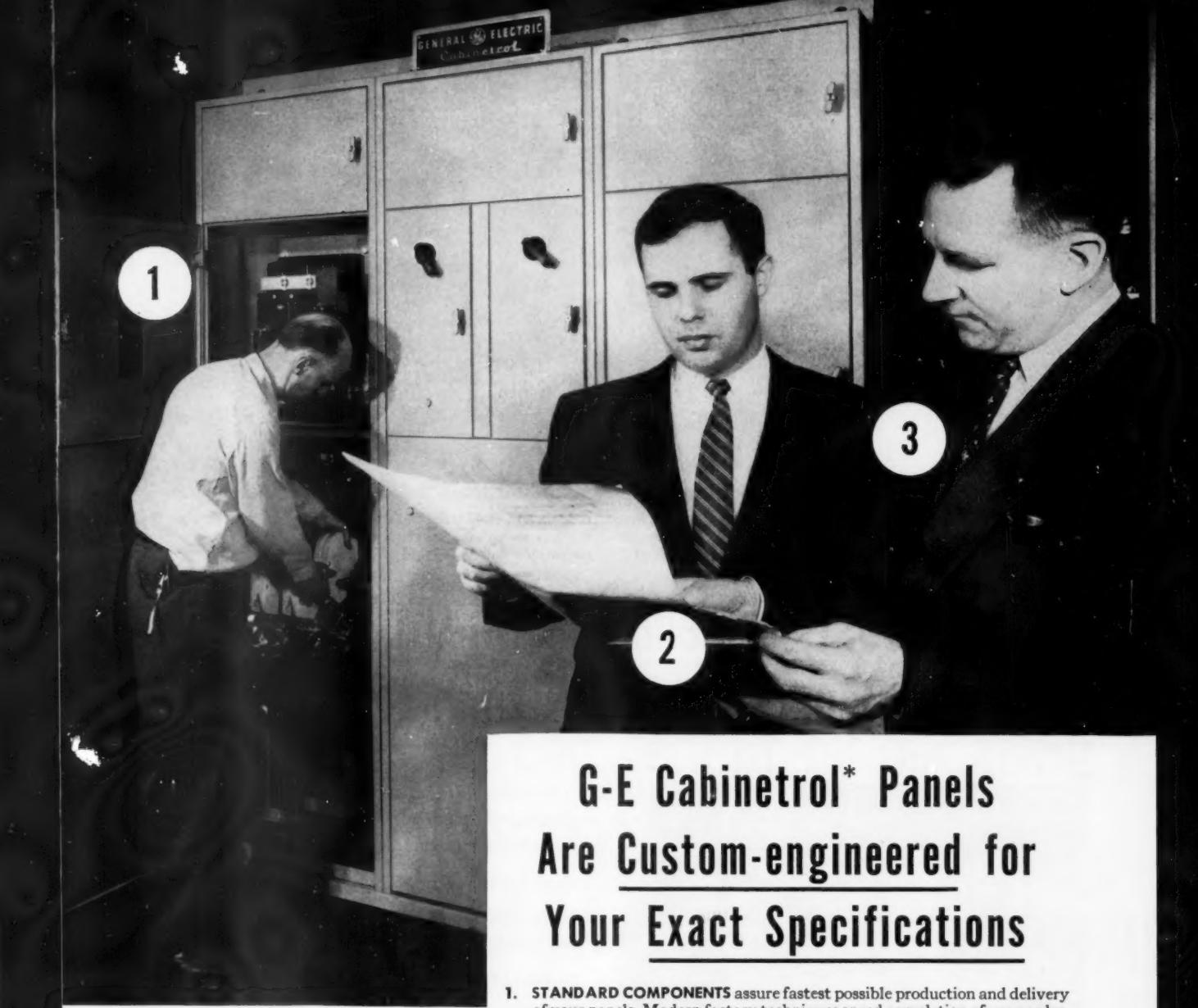
We felt compelled to face this challenge and advocate the series ballast for the 96T12 lamp because, everything considered, we believe it is the best ballasting tool for that lamp—giving equivalent performance in accordance with lamp specifications and offering a very substantial saving in cost and size.

The results are now known throughout the lighting industry. Millions of series ballasts for operation of 96T12 lamps at 425 ma have been furnished to the industry in the last three years by ballast manufacturers. And because series ballasts for this lamp are inherently 20% less costly—even more millions of dollars in basic ballasting cost have been saved for fluorescent lighting users.

It will continue to be our policy to use our engineering know-how and detailed knowledge of lamp requirements to produce and promote the sale of the very best ballast or selection of ballasts for every type of lamp. Whether lead-lag, series, or some completely new type of circuit, in our sincere best judgment, they will always represent the best ballast design to meet lamp and industry requirements. General Electric Company, Schenectady 5, New York. 401-4

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1

2

3

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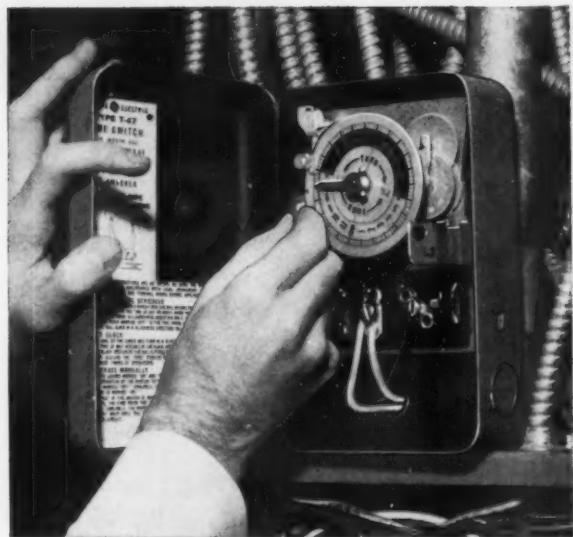
For complete information, contact your nearest G-E Apparatus Sales representative. Or write for the descriptive bulletin, GEA-3856. Section 780-4, General Electric Company, Schenectady 5, New York.

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MODERATE PRICE: For only \$11.50* G.E.'s T-47 Time Switch provides reliable on-off control for many electrical operations; eliminates manual push-button "start-and-stops."



ACCURATE ON-OFF SETTING: Minimum on-time setting, 5 min.; maximum on-time setting, 22 hrs. for 1 or 2 on-off operations daily. Only the T-47 offers such close time setting.

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PRECISION TIMEKEEPING: Once set, a long life of dependable control on a predetermined schedule is assured in this time switch by the synchronous, self-starting, Telechron† motor.

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FAST INSTALLATION—Easily removable snap-cover, plainly marked terminals at switch front, roomy hand space and five double knockouts facilitate installation.

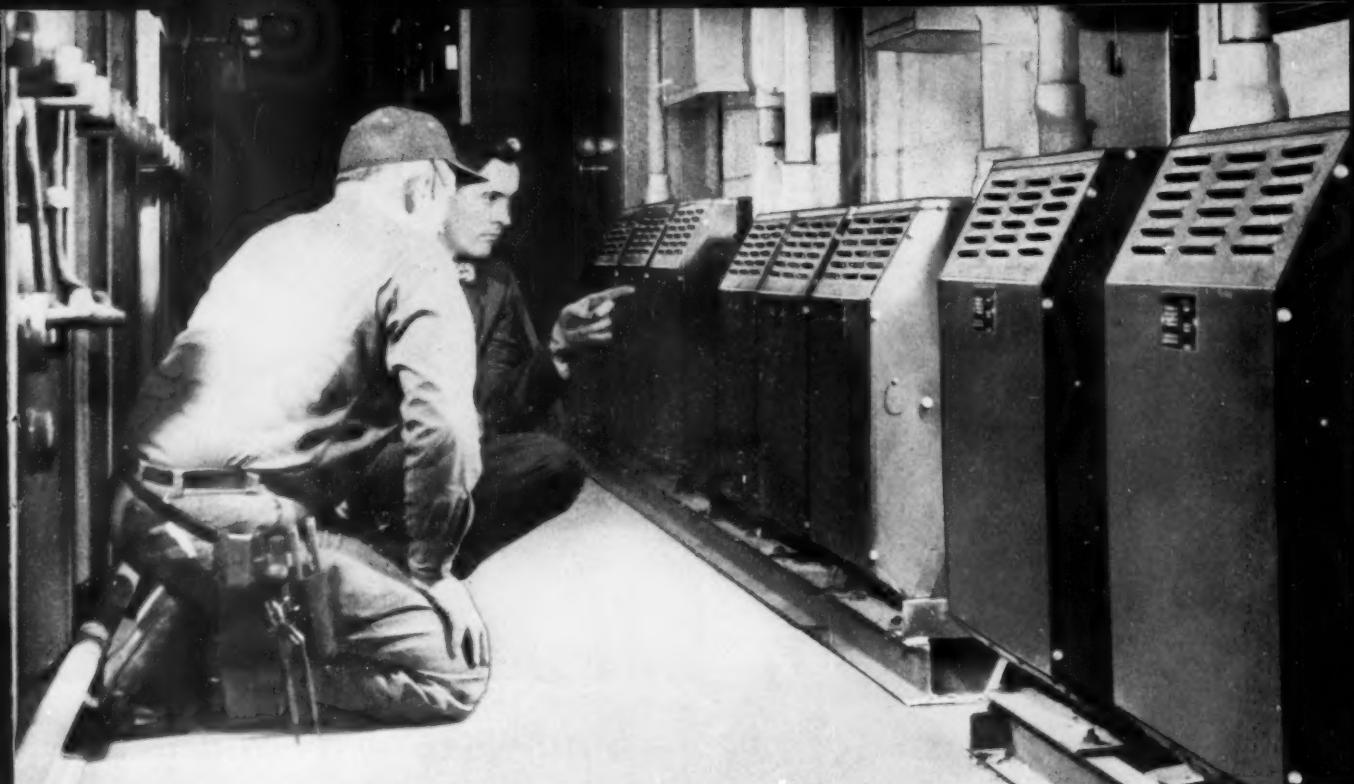
IMMEDIATE EXCHANGE PLAN—If the T-47 becomes inoperative within 18 months after date of manufacture, you receive *immediate*, over-the-counter replacement at no extra charge.

FOR MORE INFORMATION on T-47, contact your nearest authorized General Electric time switch distributor. Ask for G-E time switches at his store by name and write for Bulletins GEA-5965 and GEC-578B to Section 603-169, General Electric Company, Schenectady 5, New York.

*Mfr's suggested retail price.

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MOUNTED AT THE LOAD, G-E dry-types offer your customer savings on plant rewiring. They reduce the length of expensive

low-voltage feeders by providing the correct voltage at the load. Power dollars are stretched by reducing line losses.

Here's how you can benefit by installing General Electric dry-type transformers

Ample distributor stocks in most popular ratings mean you can get G-E transformers in the right rating, at the right time

When it comes to a low cost solution to lighting, power and space problems, contractors are finding it pays to specify G-E dry-type transformers. And a complete selection of G-E dry-types is available at your local electrical distributor.

G.E. offers you a complete selection of highest quality dry-type transformers; Type M's, rated .25 to 15 kva for use indoors or out, and Type D's, rated 25 kva and up for use indoors only.

CONVENIENT TO HANDLE, G-E dry-types are easy to install. Applied at the load, they are easy to mount in out-of-the-way places. You save valuable time . . . and you save your customer valuable space.

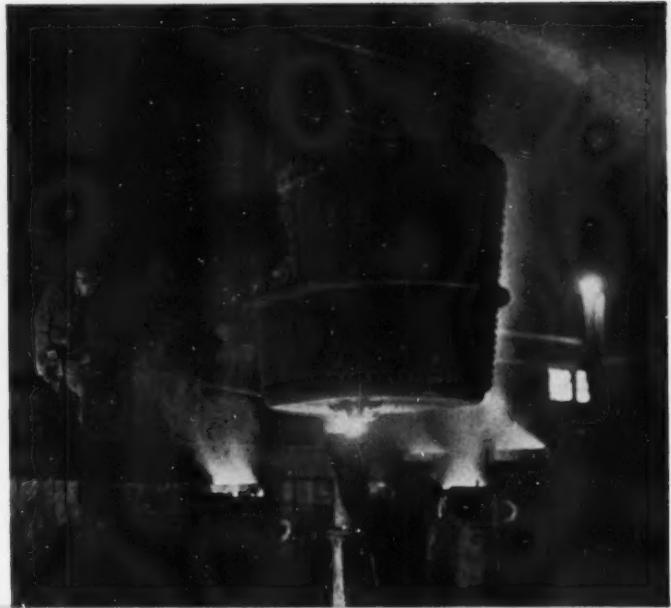
WHATEVER YOUR NEEDS—whether you are stepping voltage up or down, boosting or bucking—you can get the *right* transformer by contacting your nearby G-E distributor. For more information, write for Bulletin GED-2024 describing G-E dry-type transformers and typical applications. Address General Electric Co., Section 411-122, Schenectady 5, N. Y.

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EASY TO HANDLE, G-E dry-types like this Type M can be easily mounted on a column or wall.



Wiring problems: *high ambient temperatures . . .*



Rome Synthinol and Rome Synthinol 901 are made to withstand the effects of high ambient temperatures and corrosive conditions found in many industries.

Your choice of electrical cable or wire—especially in industrial "hot spots"—is always important.

The right choice, where there are corrosive fumes, acids, caustics, can mean protection against disintegration of the insulation in a short time. Such hazards—in steel mill, refinery, chemical plant or the like—can mean downtime, replacement cost, and loss.

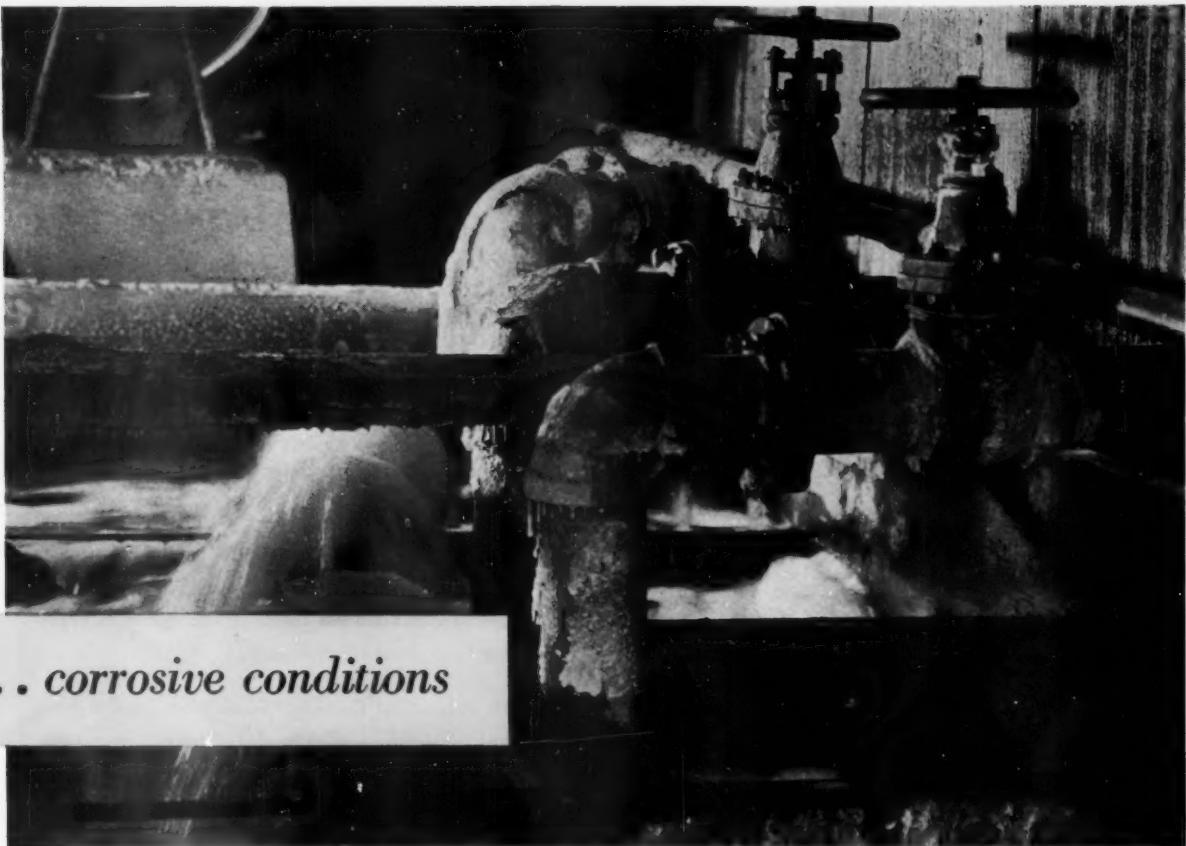
Solution

If your wiring is subjected to *heat* or *corrosion*, or both, it will pay you to check the facts about Rome Synthinol and Synthinol 901. These rugged, quality insulations were created to solve these electrical problems.

Rome Synthinol 901—It's made for the tough industrial "hot spots" in steel mills, chemical plants, refineries. Made to save you money and trouble. Here's proof:

Rome Synthinol 901 has U/L approval as Type TW for 80°C. under the National Electrical Code. As machine tool and control wire it also has U/L approval as Type TW—conforms with National Machine Tool Builders Association standards. As appliance lead wire it has U/L approval for 600 volts at 90°C. through size 4/0 AWG—and U/L approval for 105°C. on smaller sizes No. 24 through No. 18 AWG.

In short, Rome Synthinol 901 offers exceptional resistance to extreme ambient temperatures.



... corrosive conditions

This carefully compounded polyvinyl chloride insulation also has inherent resistance to acids, oils, corrosive fumes, greases and moisture.

And you will save time and money on installation, with Rome Synthinol 901—it's easy to pull, uniform in diameter—has permanent, industry-standard colors for quick circuit identification.

Rome Synthinol—Also a top-quality, tough insulation, of polyvinyl chloride, it is made for less extreme heat and corrosive conditions.

Rome Synthinol also has industry-proved high resistance to acids, flame, moisture, oils, abrasions, corrosive fumes and cutting solutions. It's U/L approved as Type TW for use in wet locations under National Electrical Code rules. Has exceptional aging characteristics. Has been adopted by many machine tool builders. Has U/L end use approval for 80°C. in air and 60°C. in wet locations or exposed to oil. You can use it for most applications up to 600 volts.

Write now for helpful, complete data on Rome Synthinol and Synthinol 901.

It Costs Less to Buy the Best



For added protection...

Rome•EMT Superior Lightweight Conduit

Whenever your wiring requires the protection of conduit, it will pay you to check the advantages offered by Rome•EMT.

It is electrically welded for maximum strength. Wall thickness and diameter are uniform. For corrosion protection its electrogalvanized surface is bonded with zinc by the famous Sendzimir hot-dip process.

Rome•EMT is designed for easy, rapid raceway installation—light in weight—good to work with. To facilitate pulling and fishing, the interior is enameled mirror smooth. No burrs or rough spots to catch or injure cables.



The Dual-Element Fuse That's Different

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Now, Even More:
FOR FUSE ECONOMY
...use ECONOMY Fuses!

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In addition to this dependable motor and branch line protection, Econ Dual-Element Fuses also guard against high temperature and its costly effects, in the fuse boxes and the connections associated with the fuse clips switches.

Econ Dual-Element Cartridge Fuses are available in knife and ferrule types; 0 to 600 amperes; 250 and 600 Volts. Underwriters' Laboratories, Inc. Approved. Carried in stock by leading Electrical Wholesalers. Write for New ECON Catalog S-60 or for literature on other type fuses in which you are interested.

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DUAL-ELEMENT
offers
DUAL-PROTECTION

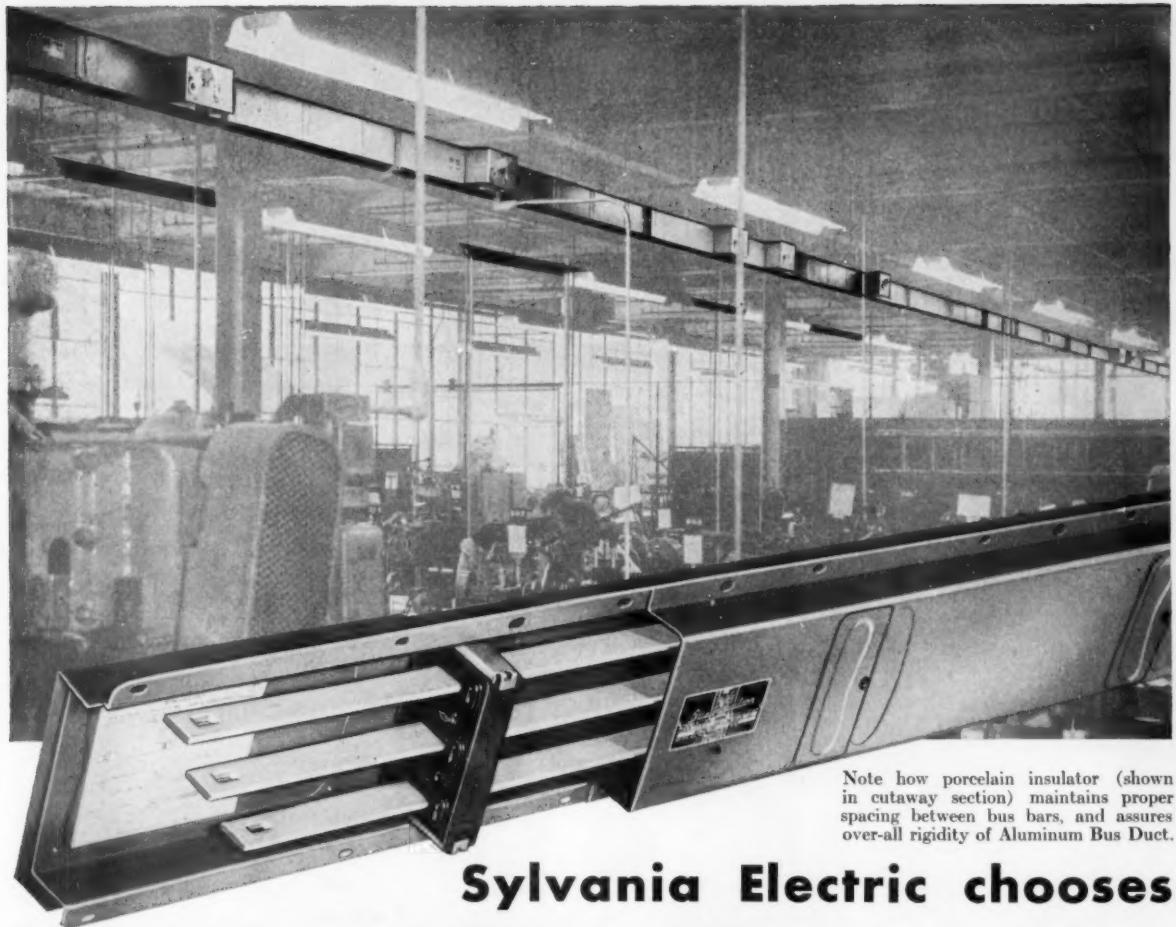
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Note how porcelain insulator (shown in cutaway section) maintains proper spacing between bus bars, and assures over-all rigidity of Aluminum Bus Duct.

Sylvania Electric chooses BULLDOG ALUMINUM BUStribution DUCT®

Sylvania Electric — a company with many years of experience in the electrical field — was one of the early users of BullDog Bus Duct with lightweight aluminum conductors. BullDog Aluminum BUStribution Duct has provided Sylvania's plants with low-cost power distribution, and has enabled them to meet expanding production requirements.

Illustrated above is an installation of flexible BullDog Aluminum Plug-In Duct feeding lights and machines at Sylvania's York, Pa. plant. In its new electronics laboratory and production plant in Mountain View, Calif., Sylvania installed a 600-foot run of BullDog Aluminum Plug-in Duct, and materially reduced the ceiling truss load. The combination of lightweight aluminum duct and the patented BullDog

scarf-lap joint meant faster, easier installation at less cost.

Operating costs are low, too. And relocation is accomplished with the same speed and economy as the original installation. Stocking accessory parts is simplified because the aluminum duct systems are completely interchangeable with other BullDog systems. This is important to those companies with many existing BUStribution installations.

BullDog Aluminum BUStribution Duct (LO-X® Duct for feeder and welder circuits, and Plug-In Duct for branch circuits) is listed by Underwriters' Laboratories, Inc. For complete information, consult your local BullDog Field Engineer. Or, write: BullDog Electric Products Company, Dept. EC-47, Detroit 32, Michigan.

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BULLDOG
ELECTRIC PRODUCTS COMPANY



The manufacturing of complex electronics equipment, metal fabrication, and machined parts at Production Facilities Co., Miami, Florida, requires a vast array of electric-powered machinery for both laboratory work and production. The power load to run these machines is heavy; so during the plant's construction the best electrical materials available were installed to assure years of reliable service.

For this reason, Spang Conduit was specified exclusively to protect the wiring. SPANGLEAM EMT, with our newly-developed inside and outside finish, is used to run service to the machines. Other parts of the system employ Spang Hot Dipped Galvanized, our lacquered rigid steel conduit with exceptional corrosion-resisting qualities.

There are many reasons why Spang Conduit is specified for so many jobs. Spang Conduit is *quality-controlled* . . . made from the best steel under exacting conditions . . . and thoroughly inspected throughout manufacture to assure you of a *top-quality* product for *top-quality* installations. Spang Conduit is easy to cut, bend and thread . . . and this means faster installation work, saving you time and money.

Whether you specify Spang Hot Dipped Galvanized, Spang Black or SPANGLEAM EMT, you'll always get better conduit when you select Spang. Write for complete information and for the name of your nearest Spang Distributor.



Owner: Production Facilities Co., Inc., Miami, Florida

Architect: Earl V. Wolfe, Coral Gables, Florida

General Contractor: Lyle Roberts, Inc., Coral Gables, Florida

Electrical Contractor: Max Belin, Miami, Florida

Spang Distributor: Westinghouse Electric Supply Co., Miami, Florida



BENJAMIN

Versatile "Magna-Flo" SYSTEMS

go to any length to fit your lighting requirements!

Yes, ONE fluorescent lighting system for all three lengths of T12 Slimline Lamps! It's Benjamin "Magna-Flo" ... so easily adapted to any size area, any type of location found in industry.

No matter where you want fluorescent light . . . high ceilings or low ceilings, assembly lines or drafting rooms, lighting for inspection or mass production . . . whatever the seeing conditions and requirements of the task, there's a "Magna-Flo" System to fill the need exactly. As shown by the chart below "Magna-Flo" is really complete . . . yet so simple to order and specify, because just three channel sizes and four basic reflectors form the backbone of over 300 different fluorescent lighting systems!

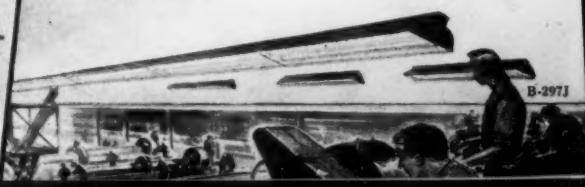
Write for Bulletin AD 5705 for complete specification data on Benjamin "Magna-Flo" . . . see how it goes to any length to suit your fluorescent lighting needs!

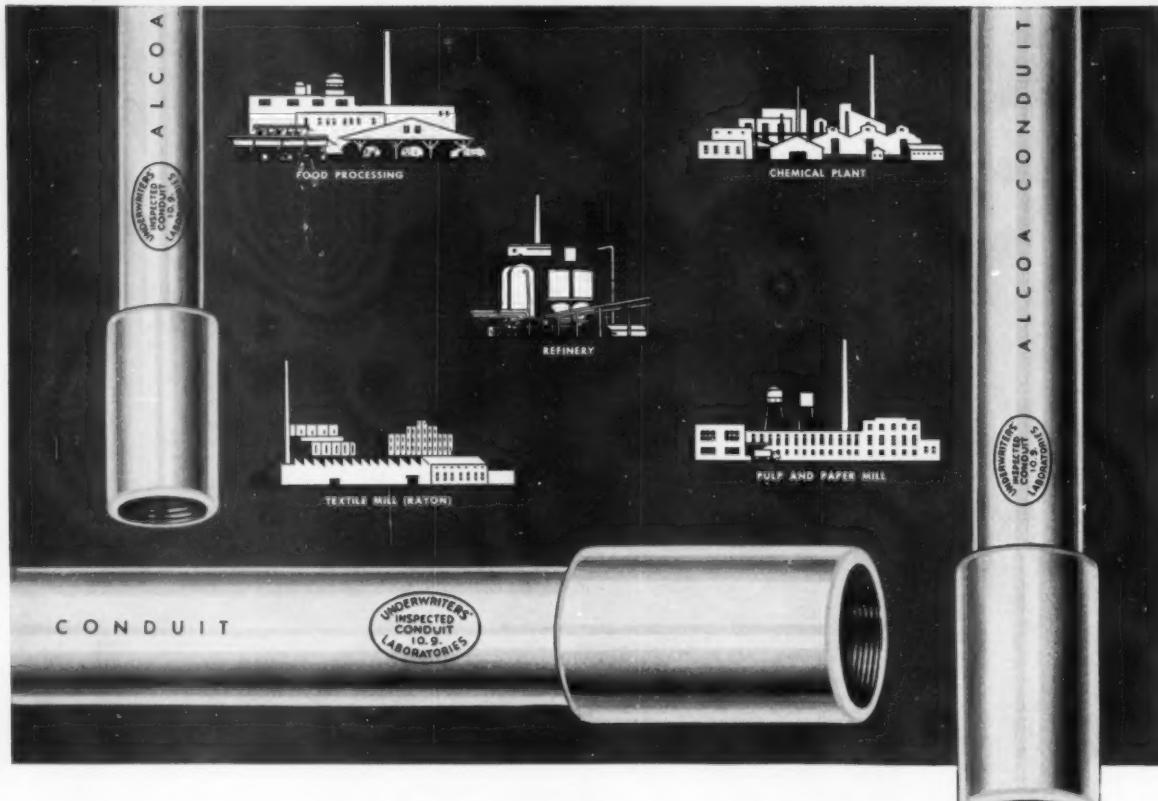
A Product of Benjamin Electric Mfg. Co., Dept. H,
Des Plaines, Ill., makers of famous Benjamin and Leader Line
Lighting Equipment and Sound Signals for Industry, Institutions
and Commerce.

3 BASIC CHANNELS		48"	72"	96"	"MAGNA-FLO"	
4 REFLECTORS		OPEN-END	CLOSED-END	OPEN-END W/APERTURES	CLOSED-END W/APERTURES	
3 LENGTHS OF T12 SLIMLINE LAMPS		48"	72"	96"		
2 LAMP HOLDERS	2-LAMP "SPRINGLOX"					
2 TYPES OF UNITS	INDIVIDUAL				3-LAMP "SPRINGLOX"	
4 ACCESSORIES	LOUVERS	PLASTIC COVERS (48" only)		GLASS COVERS (48" only)	CONTINUOUS LINES	SHIELDS
6 TYPES OF SUSPENSION	CHAIN	CONDUIT	CABLE	SINGLE-ROD	CEILING	TWIN-ROD

Sold exclusively through electrical distributors.

BENJAMIN "Springlox"—the exclusive "easy-in easy-out" lampholder which reduces maintenance costs and re-lamping time with a patented spring design . . . "Springlox" is standard equipment with all "Magna-Flo" units.





**Plants Like These Prove That
ALCOA® ALUMINUM RIGID CONDUIT
Is the Lowest Cost Corrosion-Resistant Conduit**

Alcoa Aluminum Rigid Conduit, especially resistant to industrial atmospheres that often attack other metals, costs less than any other corrosion-resistant conduit. The excellent performance of aluminum conduit in corrosive conditions means lower maintenance costs and less frequent replacement.

In addition, Alcoa Aluminum Rigid Conduit is nonmagnetic, lowers voltage drop, eliminates overcrowding of terminal enclosures and simplifies the installation of electrical equipment having widely spaced terminals.

Alcoa Aluminum Rigid Conduit reduces handling, fabricating and installation costs. It is only about one-third the weight of the same size in steel. A 10' length of the 4" size weighs only 33 pounds and can easily be handled by one man.

Alcoa Aluminum Rigid Conduit is readily available. Approved by Underwriters' Laboratories, Inc., each piece bears their label. Call your local Alcoa sales office, listed under "Aluminum" in your classified directory. **ALUMINUM COMPANY OF AMERICA**, 2108-G Alcoa Building, Pittsburgh 19, Pa.

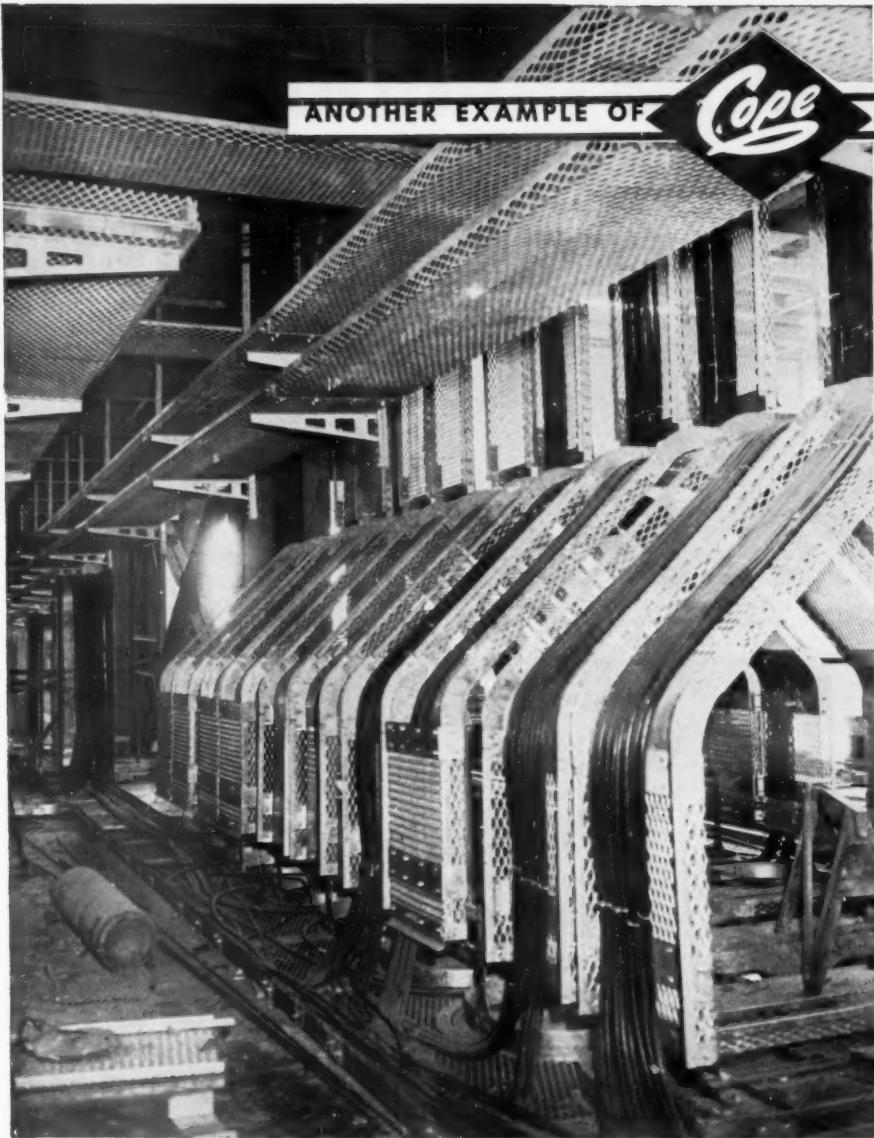


For complete information write for
Alcoa's new booklet, *Alcoa Aluminum
Electrical Rigid Conduit*.

ALCOA
ALUMINUM



ALUMINUM COMPANY OF AMERICA



ANOTHER EXAMPLE OF



EFFICIENCY...

Ohio Edison Company, Niles Station • Hatzel & Buehler—Electrical Contractors

over 2½ miles of Cope Cable Trough

. . . has been installed in the Ohio Edison Company's new 212,000 kw. steam station at Niles, Ohio, to carry both auxiliary power and control circuits throughout this gigantic structure. All circuits are readily available for maintenance, and sufficient trough area remains for additional cables necessary for future expansion.

The simplification of design through the use of standard parts, plus the ease of installation and the low installed cost, make possible many savings which may be obtained through using COPE Cable Trough.

For further information, write today for Bulletin 7M.

You know Cope by these products



711 SOUTH 50th ST., PHILADELPHIA 43, PA.

In the North and South... with REPUBLIC



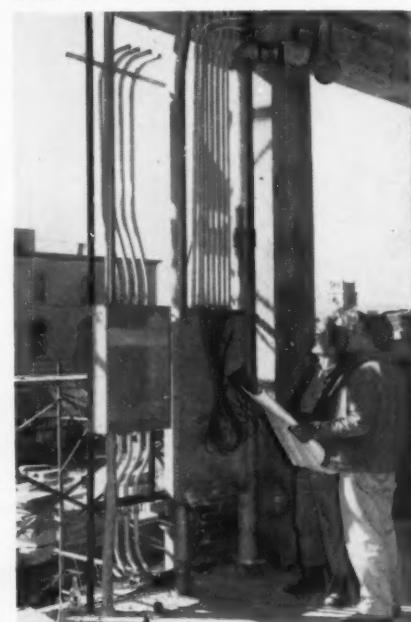
Republic "Inch-Marked" E.M.T. is approved by the National Electrical Code for concealed, exposed and concrete installations. It also meets Underwriters' Laboratories standards and carries their inspection seal.



Runs fixed at ends can be joined in the center with a standard compression coupling. No threads to cut. No lines to turn.



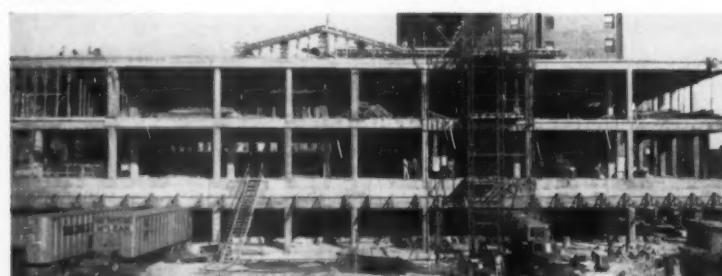
North and South—both contractors liked the way ELECTRUNITE went in on these concrete pour jobs.



Wire-pulling is up to 30 per cent easier with Republic E.M.T. Exclusive inside-knurled surface offers less resistance to wires, makes "fishing" easier.



Using the Republic Bender, symmetrical bends are easy to make right on the deck. Journey-men can make them accurately, using the "Inch-Marks" on the tube and the Calibrated Republic Bender.

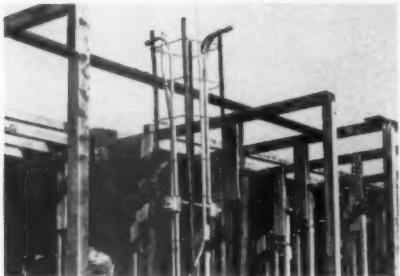


Contractors erecting two new stores, this one, in Charleston, South Carolina, and one in Madison, Wisconsin, both used Republic "Inch-Marked" Electrical Metallic Tubing.

Department Store—Madison, Wis.
Contractor: J. H. Fendorff & Sons, Inc., Madison, Wis.
Architect: Dunlap & Easgur, Chicago, Ill.
Consulting Electrical Engineers: Nelson & Nettin, Inc., Chicago, Ill.
Electrical Contractor: Curves Electrical Co., Madison, Wis.



Contractors Find They Save "Inch-Marked" ELECTRICAL METALLIC TUBING



Runs are easily located and bends accurately aligned prior to the pour.



Installing close runs like these is easier with Republic "Inch-Marked" E.M.T. Tight joints are easily made, without turning the whole raceway.

Department Store—Charleston, S. C.
Architect: Armistead & Saggus, Atlanta, Ga.
Electrical Contractor: Whitehead Electric Co., Atlanta, Ga.
Electrical Engineer: Newcomb and Boyd, Atlanta, Ga.
General Contractor: Mion Construction Co., Atlanta, Ga.



Savings is one big reason why Republic "Inch-Marked" Electrical Metallic Tubing was used on these two new stores in Madison, Wis., and Charleston, S. C. The "Inch-Marking" feature speeds accurate cutting and bending.

This light, strong, steel raceway has many installation advantages for concrete construction. Special concrete boxes aren't necessary. The tube is easily attached to connectors installed on boxes *before* spotting on the form. And it's easy for journeymen to bend accurately to fit into narrow spaces between piers.

Another feature is the inside-knurling that makes wire-pulling easier, up to 30 per cent. You find it *only* on Republic "Inch-Marked" E.M.T.

For all your jobs, concrete, exposed or concealed, use the E.M.T. that gives you the most benefits. Order Republic "Inch-Marked." For more information, write for SA-54.

REPUBLIC STEEL CORPORATION

Steel and Tubes Division

212 East 131st Street, Cleveland 8, Ohio

GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

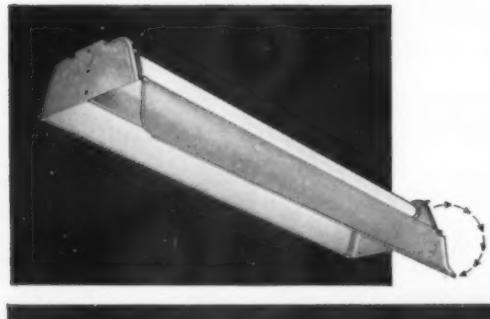


REPUBLIC ELECTRUNITE E.M.T.

• "INCH-MARKED" THE MARK OF QUALITY



Here's the Modern Way to Light a Factory ...Using Wakefield Industrial Pacemakers

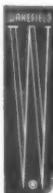
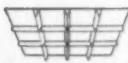


The Industrial Pacemaker is a rugged steel luminaire with all major reflecting surfaces porcelain enameled. Note that the removable side panels unhook and hinge downward for easy, safe maintenance. ETL approved, brick type ballasts deliver full rated lamp watts. For pre-heat, Rapid Start or Slimline lamps.

Note the abundance of light. Note how uniformly it is distributed. Note especially the lighted ceiling area. Only a luminaire like the Wakefield Pacemaker will give these results, for the Pacemaker transmits 25% of the light up to the ceiling to be reflected in an over-all distribution pattern all over the room.

Now note again the lighted ceiling area. Not only is this the very key to modern plant lighting, but it has the added advantage of facilitating maintenance in the upper area. Listen to what one midwestern plant superintendent says: "In parts of our plant where we use reflectors which do not allow any light to go upward, the underside of the roof and the structure beneath is black and it is impossible to see piping or other structural parts for inspection or maintenance." Those black overhead caverns in plants are out-moded, inefficient and, thanks to the Pacemaker, unnecessary. For a folder on the Industrial Pacemaker, write to The F. W. Wakefield Brass Company, Vermilion, Ohio. In Canada, Wakefield Lighting Limited, London, Ontario.

Wakefield Over-ALL Lighting





Extra
**DOLLAR
VALUE**
 IN
**GOLD SEAL
TAPES**

Gold Seal **PLASTIC** electrical tape, for example, gives you more "coverage" per roll. A few neat wraps and the job's finished — gives all needed dielectric on most jobs. Single 60 ft. rolls, cellophane protected, are packed in round metal cans. "Tape-saver" 20 ft. rolls, sized to meet average job needs and "swing" easy in tight places, are packed in 10-roll Handy Pack containers. Sample free on request. Jenkins Bros., Rubber Division, 100 Park Avenue, New York 17.

JENKINS

Gold Seal Tape

FRiction • RUBBER • PLASTIC

Also Diamond Seal Friction and Rubber Tapes made to ASTM specifications. Products of Jenkins Bros. — makers of famous Jenkins valves.



MAXIMUM

ALLIS-CHALMERS
STARTERS

ALLIS-CHALMERS

is the producer of world's largest line of major industrial equipment. Out of the many Allis-Chalmers plants rolls the most diversified array of processing machinery as well as a complete line of electrical generating, distribution and utilization equipment. As a result, A-C engineers have been called upon to solve thousands of control problems in practically every industry. This broad experience in design, manufacture and application is yours when you specify . . .

ALLIS-CHALMERS
CONTROL

Manual Magnetic Combination

Across-the-Line Starters

For squirrel-cage motors from fractional to 600 horsepower.

Manual

Magnetic

Reduced Voltage Starters

For squirrel-cage motors from 5 to 2500 horsepower. Available in autotransformer, reactor and primary resistor types.

ALLIS-

Line-to-Motor PROTECTION

...The Right Starter for the Specific Job

Built into every Allis-Chalmers starter is the type and degree of protection dictated by the application. Let's take a theoretical example . . . a starter controlling a 1000-hp, 2300-volt synchronous motor driving a ball mill.

In this case the starter could offer the following protections:

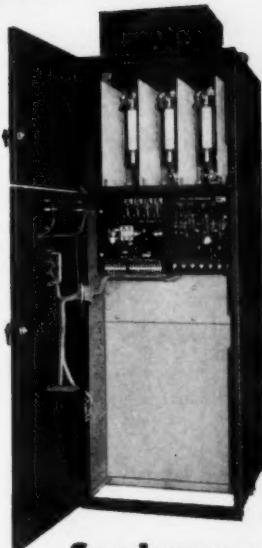
- 1. Ac undervoltage protection
- 2. Three-phase thermal overload
- 3. Open and reverse phase
- 4. Damper winding
- 5. Instantaneous shutdown on pullout
- 6. Dc undervoltage
- 7. Dc field failure
- 8. Short circuit protection

Of course, specific protection requirements vary. That's why Allis-Chalmers starters are recommended and applied with expert personal attention to the problem at hand.

In addition to necessary protection, starter functions, varying with the specific job requirements, include full voltage or reduced voltage starting, acceleration, speed control, reversing or non-reversing and dynamic braking. All Allis-Chalmers starters are available in general purpose and special enclosures to meet your requirements.

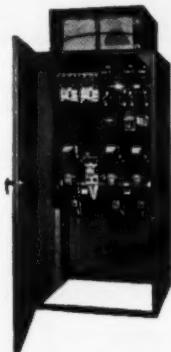
For complete information call your nearby A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

A-4250



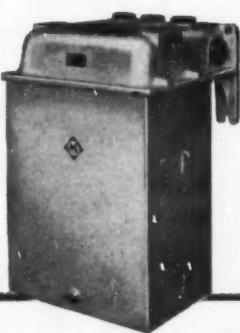
**Synchronous
Motor Starter**

features positive synchronizing,
complete motor protection.



For Wound Rotor Motors

Available in manual, mag-
netic and semi-magnetic
types.



**For 2300-2500 Volt
Squirrel-Cage Motors**
Full voltage starting. Particularly
applicable in dusty, corrosive
atmospheres and hazardous lo-
cations.

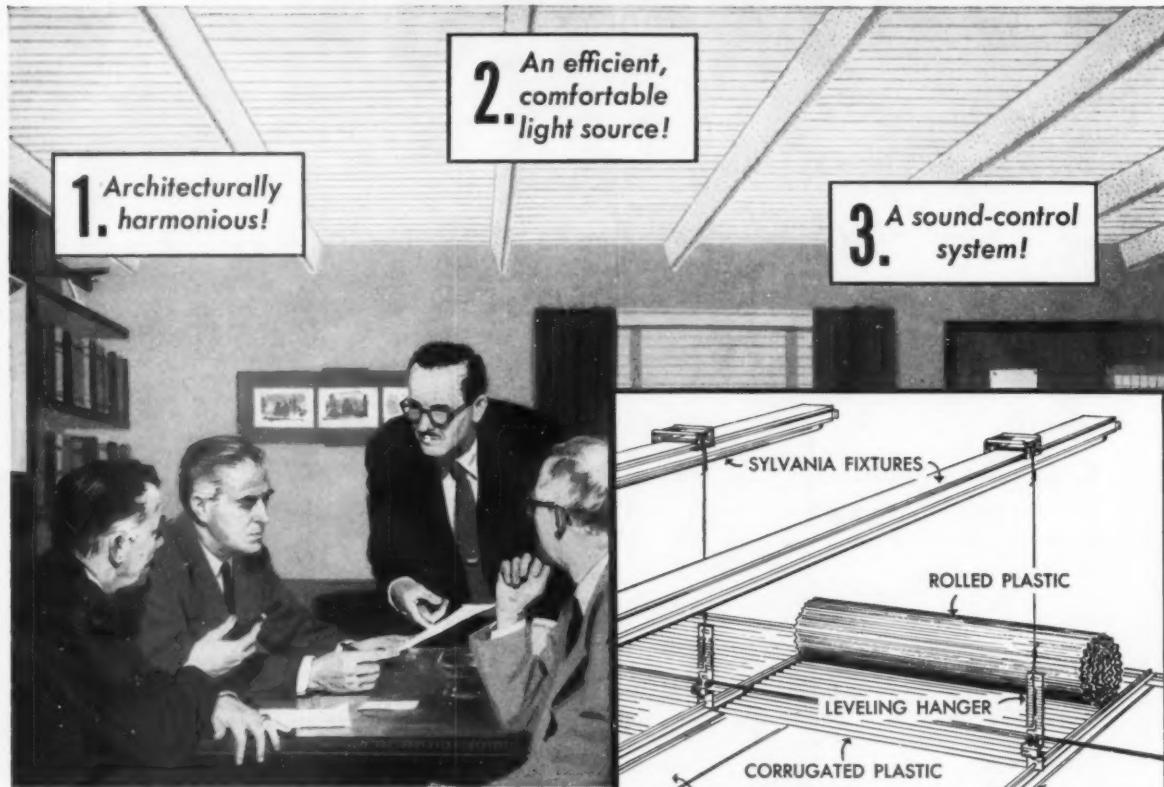
CHALMERS



Another Sylvania Achievement

SYLVAN-AIRE

A three-way functional treatment of beauty—sight—sound



Adaptable! Easily Installed! Economical!

You never saw a more fascinating or a more functional system of sight and sound control! It's engineered by Sylvania to serve 3 ways!

1st ...it has the beauty and character of continuous corrugated white plastic.

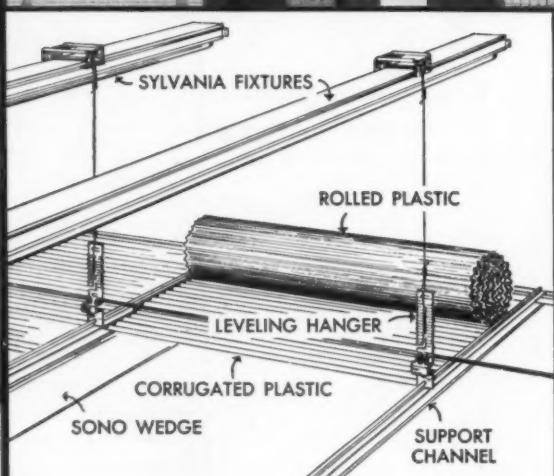
2nd ...it is a source of soft, eye-pleasing over-all lighting.

3rd ...its inconspicuous V-shaped "Sono-Wedges," lined with thick glass-fiber pads, deaden noise...reduce distracting sound to comfortable levels.

In addition, the corrugated form of the plastic permits air to circulate along the supporting channels. Thus *air-conditioning* also can be effectively introduced.

Flexible in Design!

Sylvan-Aire's light weight and flexibility of design permit it to be readily and economically installed in any conference room, office or working area. Be sure to show your architectural and building customers this latest Sylvania achievement. For full details write today to Dept. 4X-2407 at Sylvania.



Showing details of Sylvania's new functional Sylvan-Aire. For ease and economy of installation, wire supports shown here are attached to lighting fixtures instead of structural ceiling.



Display this nationally advertised emblem which identifies you as the Sylvania Qualified Lighting Contractor in your vicinity.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, N.Y. 19, N.Y.

 In Canada: Sylvania Electric (Canada) Ltd., University Tower Bldg., St. Catherine Street, Montreal, P. Q.

LIGHTING • RADIO • ELECTRONICS • TELEVISION



TOUGH...

BEND 'EM, POUND 'EM, TWIST 'EM



These new T & B Insulating Bushings are designed to withstand rough treatment. Made of tough cellulose acetate butyrate, they're the toughest Insulating Bushings available today.

Use T & B's new Insulating Bushings wherever NEC requires protection for cable sheath or wire insulation against damage from burred or unevenly cut conduit... or for the ultimate in protection even where not required. Send today for a free sample and descriptive literature.



Toughest Insulating Bushing Available Today... Can be used over and over again...shatterproof.



Vibration-Proof... Easily installed by hand, yet a wrench is needed to take them off. Bushing threads *lock* onto conduit.



Resists Corrosion... Unaffected by common acids, solvents, moisture or fumes.



Blue Color... Provides easy identification for electrical inspectors.



LOOK FOR THIS SIGN —

IT'S THE MARK OF AN AUTHORIZED T & B DISTRIBUTOR

The complete line of T & B fittings for conductors and raceways is sold only by recognized electrical wholesalers. It's our way of assuring you the service and savings of a friendly local source. Call him for all your electrical needs.

T44

THE THOMAS & BETTS CO.

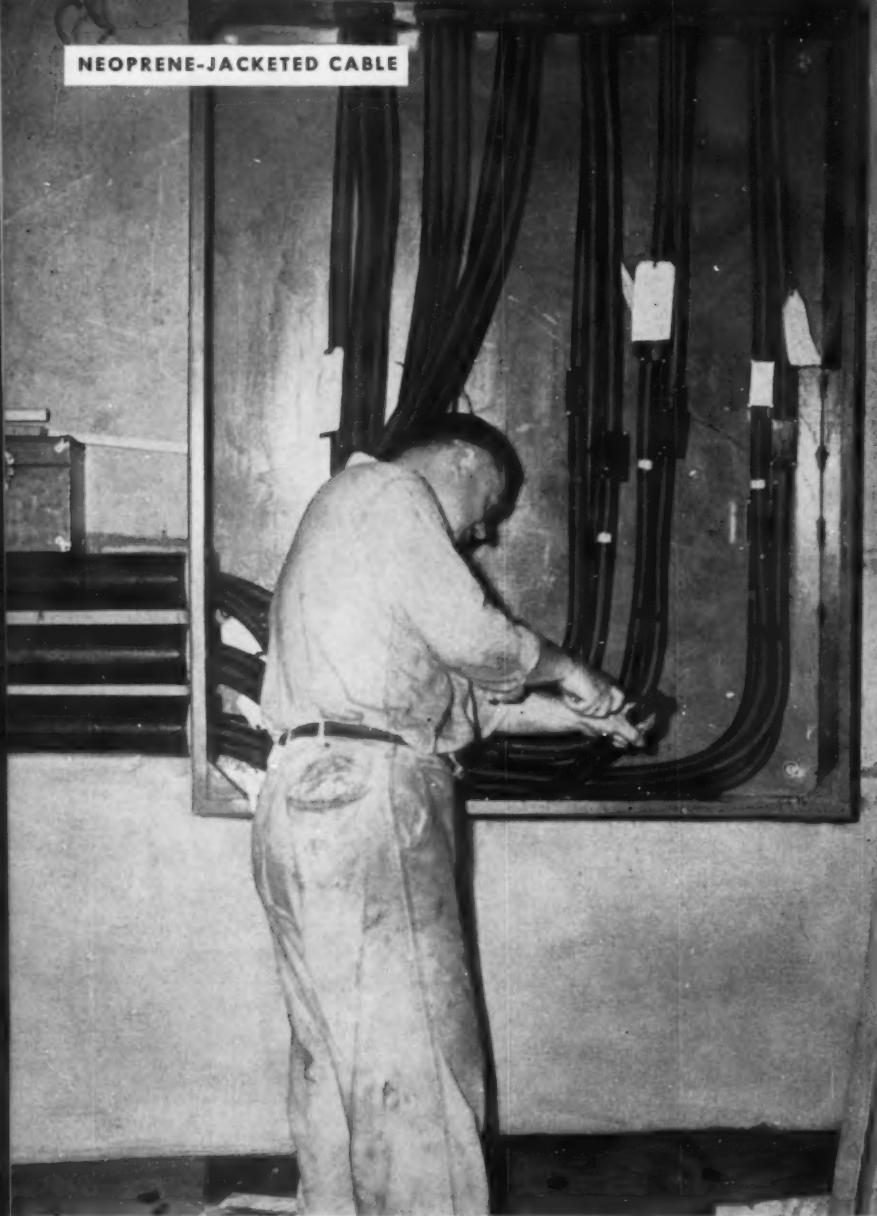
INCORPORATED

34 Butler Street • Elizabeth 1, New Jersey

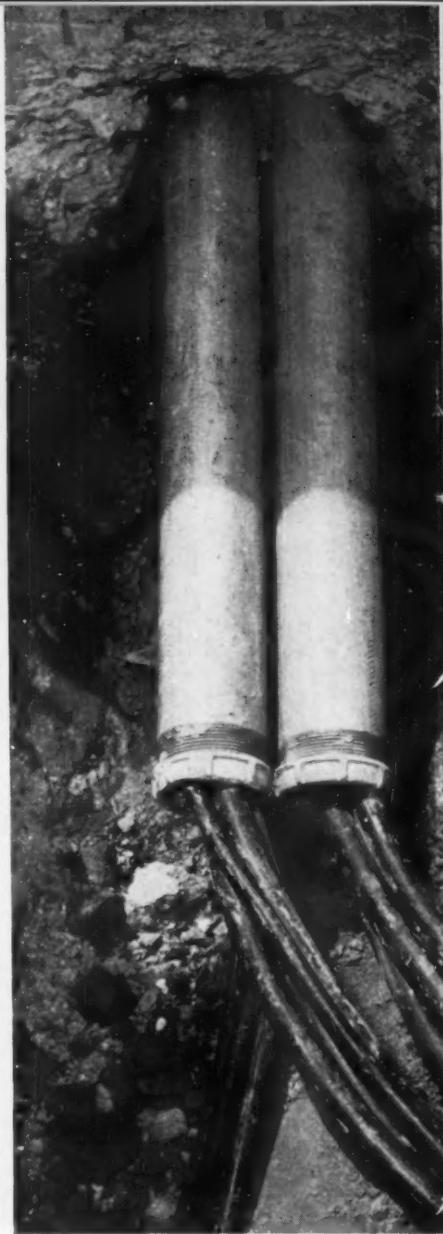
Thomas & Betts Ltd., Montreal, P.Q., Canada

MANUFACTURERS OF FINE ELECTRICAL FITTINGS SINCE 1894

NEOPRENE-JACKETED CABLE



... FOR PLANTS



How to get premium wiring for little more

The cable to use is DURASHEATH.
Its actual over-all cost is so little more
than the cheapest cable

Wait! Before you buy cable on price alone, see how *little* a premium wiring job actually costs. And what good insurance it is!

When you're wiring up, for power or lighting, the price of wire and cable is but a *fraction* of the over-all cost. Simple arithmetic follows — *it makes very little difference in the total cost of the job whether you buy*



...FOR UTILITIES



...FOR COMMERCIAL BUILDINGS

than you now pay

the cheapest cable or a premium cable like neoprene-jacketed Durasheath*.

But what a difference there can be in performance!

Anaconda's Durasheath is tough . . . heat-resistant . . . long-lasting. Its rugged neoprene jacket resists moisture, chemicals, sunlight, corrosion, electrolysis, abrasion and mechanical injury. It delivers real service de-

pendability year after year.

And Durasheath is good for almost any job you have. You can bury it directly in the ground . . . run it in damp ducts . . . string it overhead . . . in one continuous run with minimum splicing. Order through your Anaconda Sales Office or distributor. *Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.*

*Reg. U. S. Pat. Off.

ANACONDA®

Primary and secondary distribution cable •
building wire • portable cords and cables •
mine cable • magnet wire • copper, aluminum,
copperweld conductors • signal, control and communication wire • wire and
cable accessories.

64366



four areas here are custom lighted by
Litecontrol

Variations in height and spacing of a single LITECONTROL fixture give each of the four working areas on this warehouse floor just the right light for its needs. Intensity is low in the heavy storage area (foreground), higher over the accessories racks (background). Other work areas, each custom lighted, are the assembly line (near the rear wall) and the loading area (by the doors).

Everywhere, the illumination is evenly distributed, easy on the eyes. The fixture used — LITECONTROL 2428 — is semi-direct, throwing almost 40% of its light upward to minimize harsh contrasts. Its efficiency is an unusually high 86%.

Installation and maintenance of LITECONTROL 2428 is easy because of its simple, two-piece, all-metal construction. Its smooth, curved surfaces wipe clean in seconds and encourage convection currents that have a self-cleaning action.

High efficiency, low brightness, ease of installation and maintenance, and versatility make LITECONTROL unbeatable for industrial lighting. Whether lighting or relighting, call on your local LITECONTROL representative.

INSTALLATION: Sun Oil Company, Dayton, Ohio

AREA: Warehouse

PROJECT ENGINEER: Alex M. Engart, Engineering Dept.,
 Marketing Division, Sun Oil Company

ELEC. CONTRACTOR: Heilboerfer-Castellini, Dayton, Ohio

FIXTURES: Litecontrol No. 2428 2-lamp slimline industrial

MOUNTING HEIGHT: 17'-6" and 9'-0"

INTENSITIES: Over storage racks (foreground), 15 Footcandles
 in service — Accessories racks (low fixtures, background),
 35 Footcandles in service — Motor Oil Assembly lines
 (background), 25 Footcandles in service — Loading area
 (near doors) 15-20 Footcandles in service



LITECONTROL
Fixtures

LITECONTROL CORPORATION

36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

25-year-old Manson tape exceeds ASTM specs

A railroad electrical engineer questioned us the other day in reference to the lasting quality of our Okonite and Manson Tapes. This recalled a letter we received a few years back



from a man who had bought a roll of Manson tape 25 years before. His letter said:

"There is not much left on this roll of Manson tape, but I have been pulling a little off this roll for 25 years...I have the original tin box and always keep the tape in it and the little bit that is left is still good." And he enclosed what was left of the tape.

We couldn't make all the ASTM tests because of the small amount left. But we made a tensile strength test and found that the sample tested about 25% above the ASTM minimum. It also *withstood the ASTM dielectric strength test of 1000 volts without breakdown.*

There are lots of case histories like this in our files. Remember, when you specify tape, you really want protection for the weakest part of the cable. Your best security is in the best tape.

Economy in tape is a long-range proposition. Okonite and Manson tapes will keep the splice tight and waterproof longer than ordinary tapes and consequently will help cut down high maintenance costs. It's "spliced for life" when you use Okonite premium quality tapes.

Why not send for a set of instruction sheets, EC-5678; you'll find them helpful.



...when you splice with:



AVAILABLE
THROUGH
AUTHORIZED
DISTRIBUTORS ONLY

1434



SPECIALISTS IN ELECTRICAL WIRES, CABLES AND SPLICING MATERIALS FOR 75 YEARS





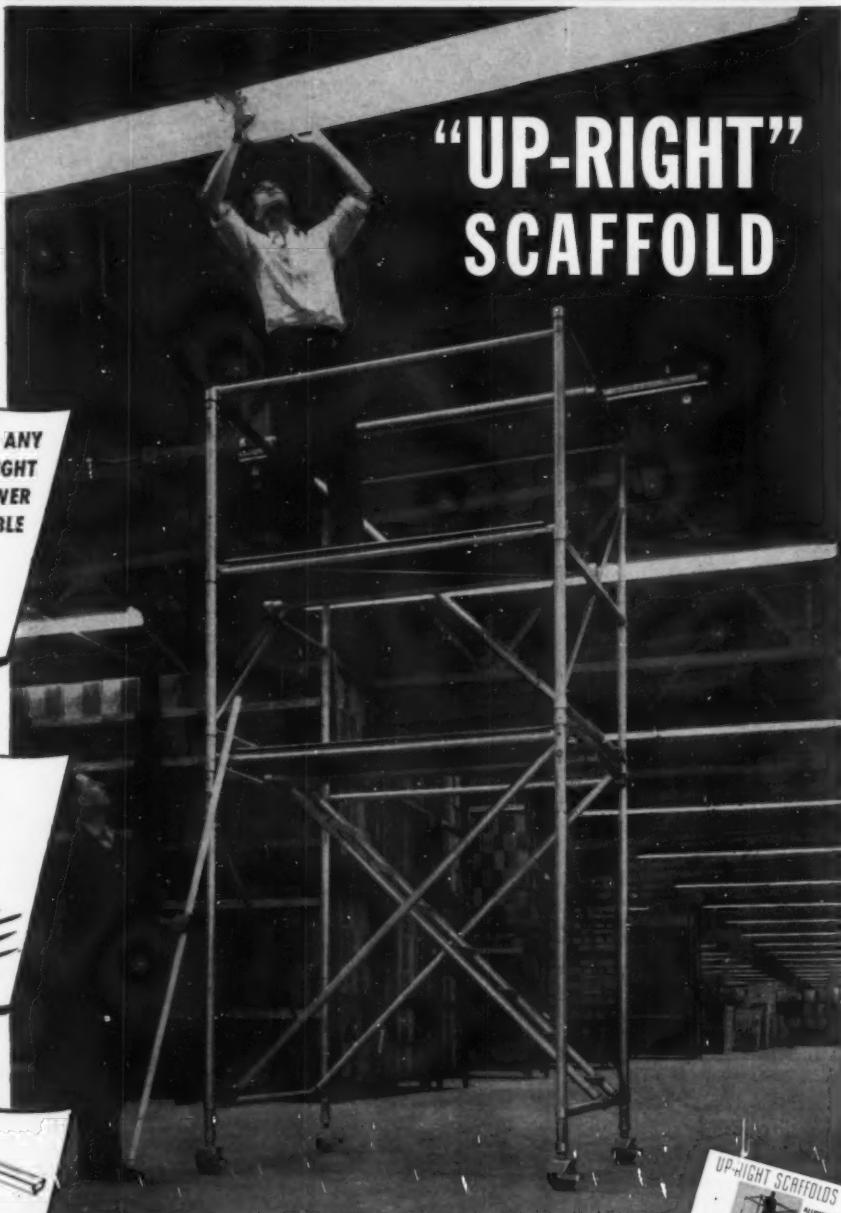
WALTER D. VANCE, JR., Vice President • California Electric Co., reports:

**"We saved 14 days installing
527 fixtures by using
'UP-RIGHT' Scaffold-on-Wheels"**

Man-hour savings on this General Motors warehouse job amounted to over 40%. Up-Right Scaffold is so light it is easily assembled by one man. Individual 1 piece aluminum alloy sections are unfolded and set one on top of the other. They lock into place instantly.



ANY
HEIGHT
TOWER
AVAILABLE



"UP-RIGHT" SCAFFOLD

Write for descriptive circular ➤

"UP-RIGHT" SCAFFOLDS

Dept. 159 • 1013 Pardee Street • Berkeley, California

Factories: Berkeley, Calif. and Teterboro, N. J. • Offices in all principal cities

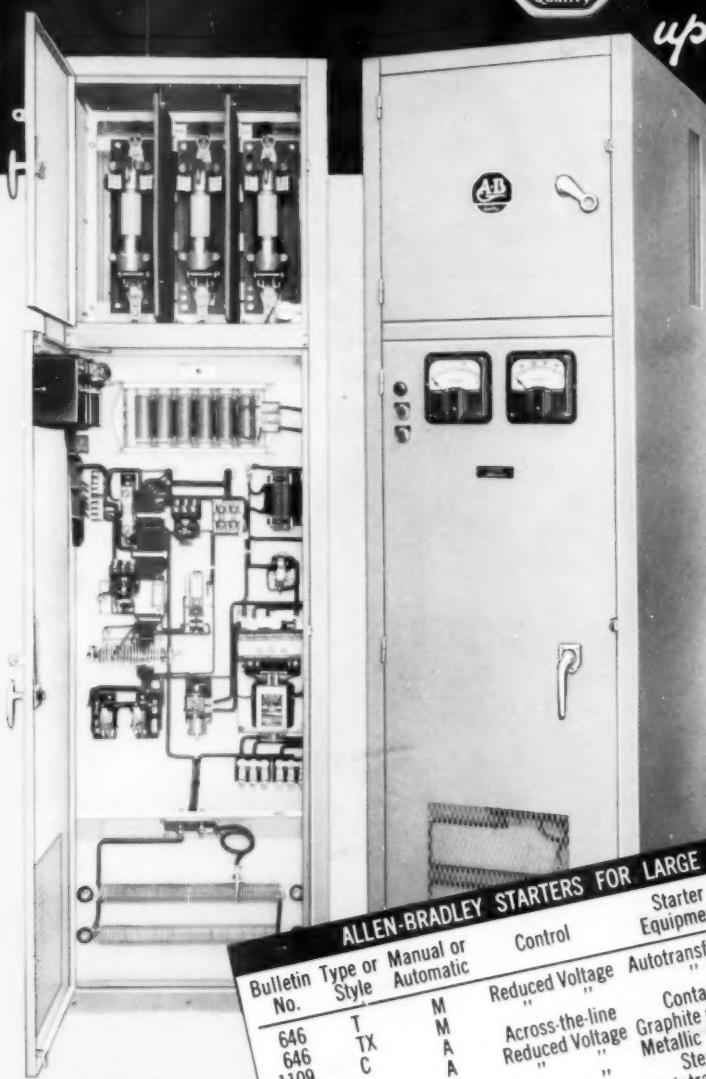


LIFETIME



STARTERS

up to **1500 HP**



Bulletin 906 Style C high voltage synchronous motor starter with current-limiting fuses. Self-protecting against short circuits up to 150,000 kva on 2500 volts or 250,000 kva on 2501 to 4600 v. The high tension, solenoid operated, across-the-line oil-immersed switch is mounted in oil tank behind the panel. Cabinet has hinged doors on front and back.

There are 14 different types of these rugged Allen-Bradley starters. (See listings below.) Some are of the across-the-line type . . . but most of them are reduced voltage starters using resistors, transformers, or reactors during the starting period.

These starters are available in 2500 to 4600 volt ratings for squirrel cage motors from 700 to 1250 hp, and for synchronous motors from 800 to 1500 hp. They are listed for squirrel cage motors from 125 hp, 220 v to 600 hp, 440-550 v, and for synchronous motors from 350 hp, 220 v to 700 hp, 440-550 v.

For complete details, please send for the A-B Handy Catalog.

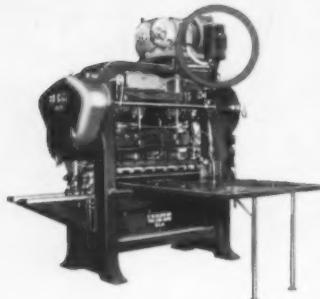
ALLEN-BRADLEY STARTERS FOR LARGE SQUIRREL CAGE MOTORS						
Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage	
646	T	M	Reduced Voltage	Autotransformer	125	250
646	TX	M	"	"	"	700
1109	C	M	Across-the-line	Contactor	200	200
740	A	A	Reduced Voltage	Graphite resistors	300	600
741	A	A	"	Metallic resistors	300	600
742	A	A	"	Stepless	300	600
746	AT	A	"	Autotransformer	300	600
1146	CT	A	"	"	"	"
					700	1250

ALLEN-BRADLEY STARTERS FOR LARGE SYNCHRONOUS MOTORS						
Bulletin No.	Type or Style	Manual or Automatic	Control	Starter Equipment	Maximum Horsepower at Rated Voltage	
906	A	A	Across-the-line	Contactor	350	700
906	C	A	Reduced Voltage	Resistors	250	250
914	A	A	"	Autotransformer	350	700
922	AT	A	"	"	800	800
922	CT	A	"	R	800	1500
922	CR	A	"	"	800	1500

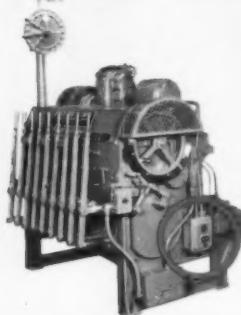
7-54-M

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

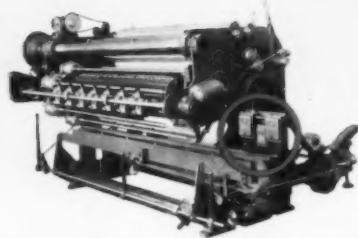
ALLEN-BRADLEY
TROUBLE FREE MOTOR CONTROLS
QUALITY



PERFORATING PRESS



GAS CONTROL



PAPER ROLL REWINDER

ACROSS-THE-LINE STARTERS FOR ALL TYPES OF MACHINES

A Uniform Line up to 300 HP, 220 V; 600 HP, 440-550 V

It is a distinct advantage to both buyer and user of motorized machines if the across-the-line starters have a family resemblance over the entire range up to 300 hp, 220 v; 600 hp, 440-550 v. For example, Allen-Bradley solenoid starters are so nearly alike over this range that to be familiar with the structure and operation of a 5 hp starter provides equal familiarity with an Allen-Bradley 500 hp starter. This advantage is limited only to the Allen-Bradley line.

Bulletin 709 solenoid starters are available in dust-tight, waterproof, explosion-proof, and corrosion-proof enclosures.

The Allen-Bradley Handy Catalog is a handbook of control information. Send for a copy.



Sizes 0 to 5



Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

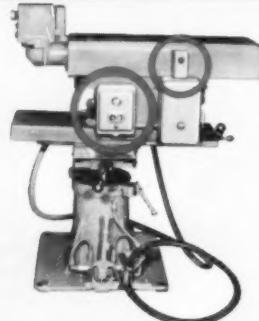
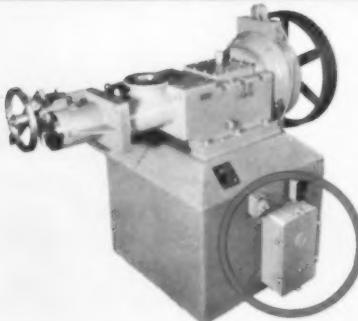
ALLEN-BRADLEY
SOLENOID STARTERS

QUALITY

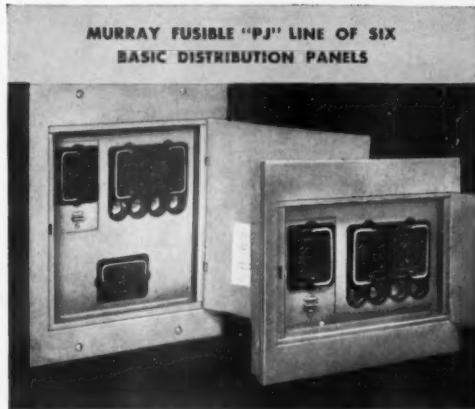
EXTRUDING MACHINE

WRAPPING MACHINE

BURR REMOVER



NEW MURRAY "PJ" LINE CUTS COSTS...SAVES TIME!



This 60-amp fusible equipment comes with 3 or 4 pull-outs and 4, 6 or 8 branch circuits, in series or parallel. Handles almost any load combination. Panels have dead front construction, are finished in attractive baked-on grey Melamine. Famous Murray quality throughout.



Everything: Main, Lighting & Appliance, and Power circuits—complete in one compact box. Everything goes up at one time. Note special sealable compartment containing one pullout—ideal for separate rate off-peak water heating. Barrier removable when not required.



MURRAY MANUFACTURING CORPORATION

1250 Atlantic Ave., Brooklyn 16, N. Y.
Service Entrance & Meter Equipment • Fully
Magnetic Circuit Breakers • Switches (Types A,
C & D) • Current Limiting Reactors • Crows'
Nest Aerial Ladders

... helps you meet increased loads at decreased costs!

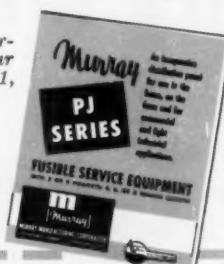
The attractive, low-cost PJ line is designed to help you handle increased loads on home, farm and commercial jobs with a minimum of equipment. With only six basic panels you get full-line versatility for almost any combination of light, appliance and power circuits. Minimum-stock line also means easier ordering and stocking for you

... saves you more time and money on installation!

Putting up PJ panels is clean, fast work with installation time cut to the bone. There are plenty of clean-cut, easy-to-remove KO's just where you want them. Plenty of knuckle room, too. And no wire fumbling—you'll find high quality solderless connectors on all terminals conveniently located. Surface hook-on cover saves extra time.

In every way, Murray PJ panels are ideal for low-cost installations. Your Murray wholesaler has them now. Lay in a supply today and be ready for any job that comes along.

For complete details and wiring diagrams, ask your wholesaler for Bulletin 231, or send the coupon in.



send
coupon
today!

Murray Manufacturing Corporation, 1250 Atlantic Avenue, Brooklyn 16, N. Y.
Gentlemen: Please send me Bulletin 231 on the new Murray PJ series of distribution panels.

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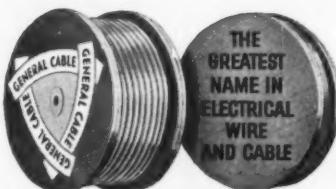
THE GREATEST NAME IN ELECTRICAL WIRE AND CABLE



Everything being equal

IT'S THE SERVICE THAT COUNTS!

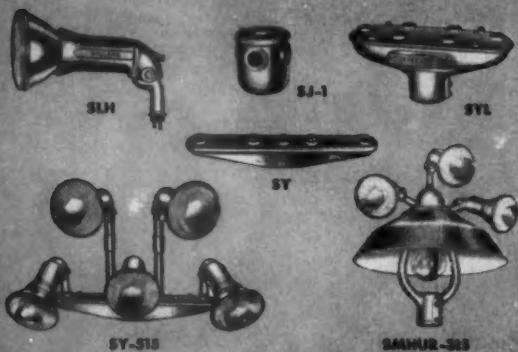
It is the simple objective of General Cable service to make our products both easy and pleasant for you to buy. We do it with more than 650 courteous, well-informed distributors. We do it with over 600 stock distribution points and 12 warehouses. We do it with 27 sales offices, plus 14 helpful resident salesmen. We do it with 6 strategically located manufacturing plants. This is a combination unmatched in the industry. We invite you to try it!



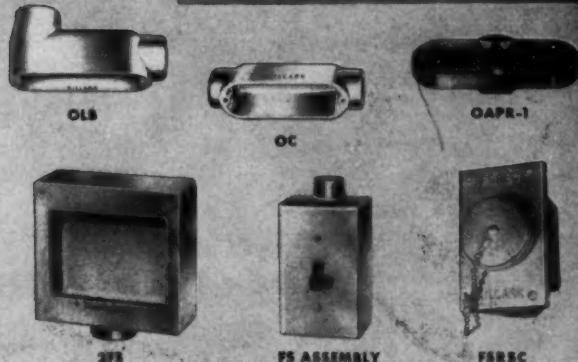
BARE, WEATHERPROOF, INSULATED WIRES
and CABLES FOR EVERY ELECTRICAL PURPOSE

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CONDUIT BODIES & COVERS



KILLARK

the **FIRST**
to bring you
a Complete line of
Aluminum Fittings & Fixtures

Quality-Designed in

KILLARK ALUMALLOY

...the 20th Century Metal!

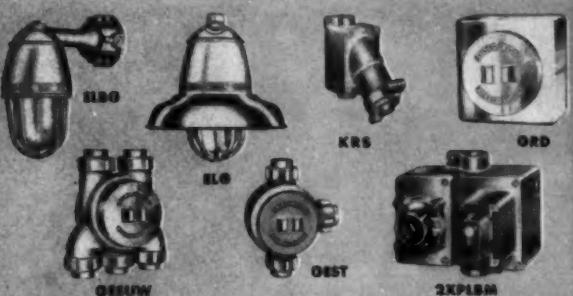


Killark

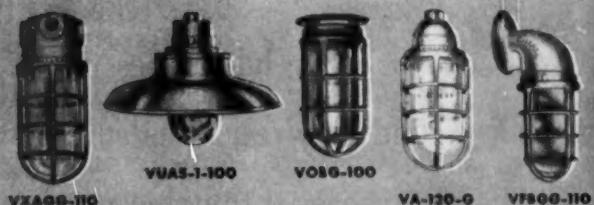
SERVICE ENTRANCE FITTINGS



EXPLOSION-PROOF FITTINGS & FIXTURES



VAPOR-TIGHT FIXTURES



There's a Killark Fitting or Fixture in
the Right Size and the Right Style to
Fit Your Installation Needs.

ELECTRIC MANUFACTURING COMPANY

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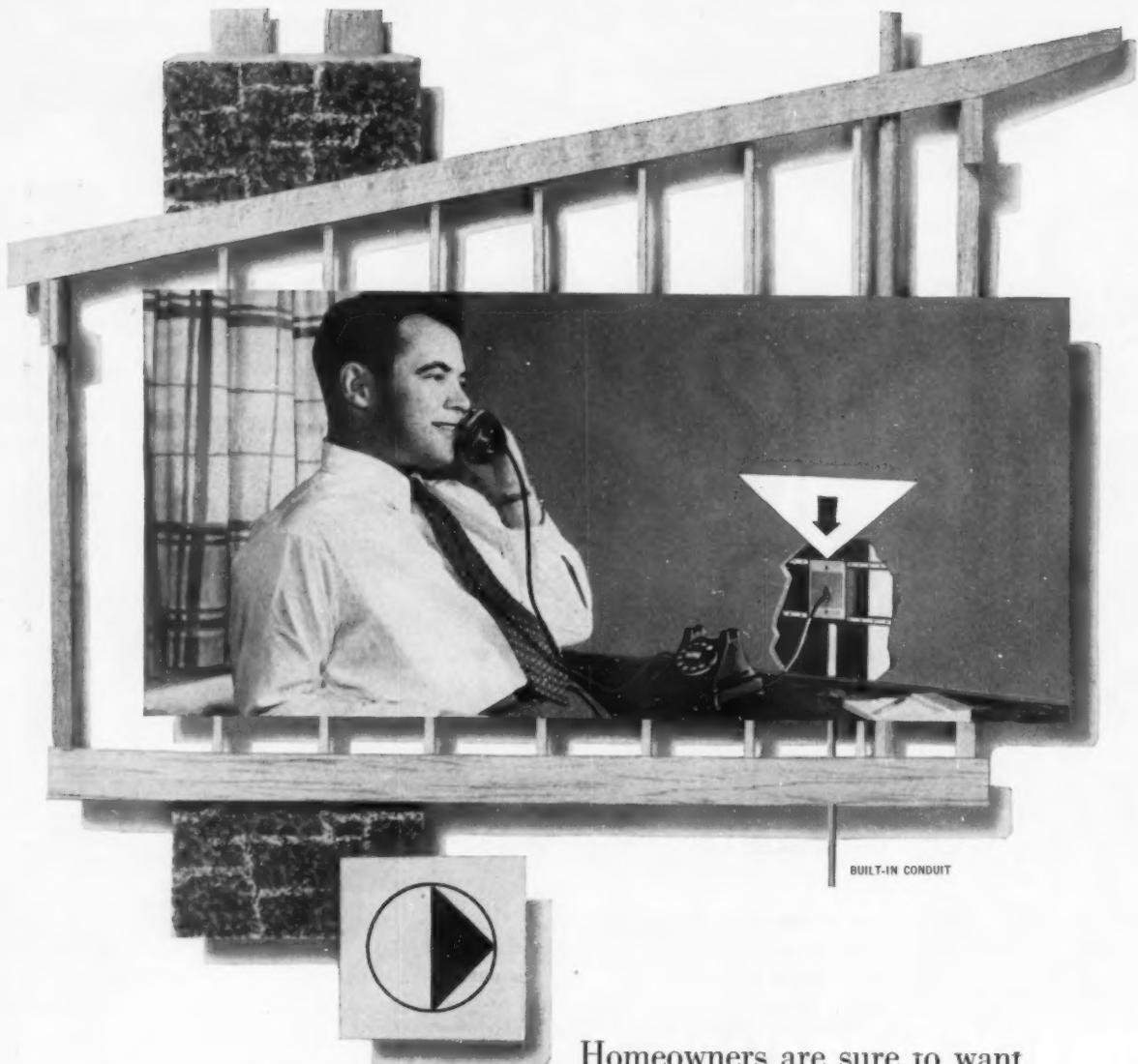
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BUILT-IN CONDUIT

Homeowners are sure to want
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And they're just as sure to want telephone wires concealed.
There's an easy, profitable way to keep
telephone wires out of sight: Include telephone conduit
in all electrical contracts.

Your Bell Telephone Company will be glad to help you work out economical
conduit installations. Just call your nearest Business Office.

BELL TELEPHONE SYSTEM





TIREX

doesn't have to be babied!



TIREX Portable Cords are favorites with most workmen because they never have to be babied. Why? Because TIREFX has the extra toughness that takes lots of abuse. On most jobs, there isn't time to keep cords out of harm's way. That's where TIREFX pays off.

TIREFX resists abrasion like no other cord because it's cured in lead. It will stand a sur-

prising amount of crushing. Sunlight doesn't bother it. The smooth jacket on TIREFX Cords slides easily around obstructions and doesn't snag or tear on sharp edges.

The conductors in TIREFX Cords are stranded to be extremely flexible. They are insulated with a high-grade rubber compound. TIREFX Cord jackets are made of Selenium Neoprene Armor and cured in lead for unequaled resistance to acid, oil, water and flame.

TIREFX Cord retains its flexibility, toughness, and wear-resisting qualities indefinitely. Wherever working conditions call for unusual stamina and endurance in portable cords, that's the place for TIREFX. The next time you need portable cords, get some TIREFX.

Simplex

TIREFX

CORDS AND CABLES

are made only by the

SIMPLEX WIRE & CABLE CO., 79 Sidney St., Cambridge 39, Mass.



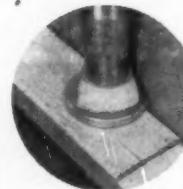
How the **VELOCITY-POWER** DRIVER helps you get more contracts—maintain profit levels

Designed for speed, ease of handling, and maximum safety, the Velocity-Power Driver gives you a real competitive advantage, without sacrificing profit. The unit is equipped for any stud-driving task. Interchangeable barrels let you drive either $\frac{1}{4}$ or $\frac{3}{8}$ -inch studs from the same firing unit. You have a wide selection of studs—solid head, internal or external threaded types. And because the cartridge and stud are integral, there's no time wasted matching and fitting.

Special care was taken to provide utmost safety. Unique barrel design avoids ricochet, flash, recoil. A spring-loaded safety arm that must be rotated and held before firing prevents accidental discharge. Permanently attached spall-shield adds to the safety factor of the unit. All cartridges are center-fire types, completely assembled, and color-tipped to assure the right load for the job.

Write today for complete details . . . see how the Velocity-Power Driver can help do more work, faster, and still maintain your profit level on every job.

VELOCITY POWER TOOL COMPANY
201 North Braddock Avenue, Pittsburgh 8, Pa.



There's no slow-down on those narrow, recessed spaces or close-to-the-wall jobs. The spall-shield is readily retractable, or a portion of the shield can be rotated out of the way. Quadrant marks on the shield provide accurate installation of the stud.



The Velocity-Power Driver, with separate spall-shield, featuring all the advantages of the above unit, is also available. This serviceable Driver is especially useful when a great deal of work in deeply recessed areas is required.

DIAL THE SPEED—CONTROL THE PROCESS

with a Performance Rated *Century*
SELECTIVE SPEED DRIVE

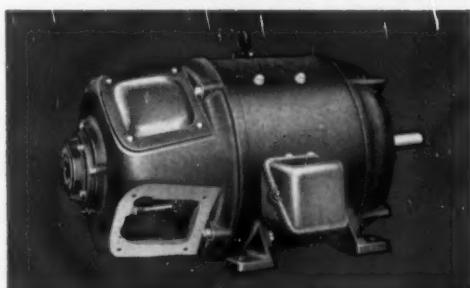
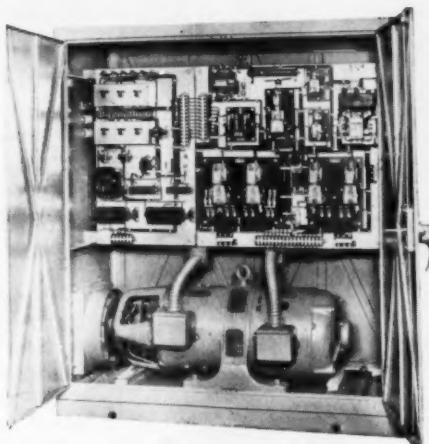
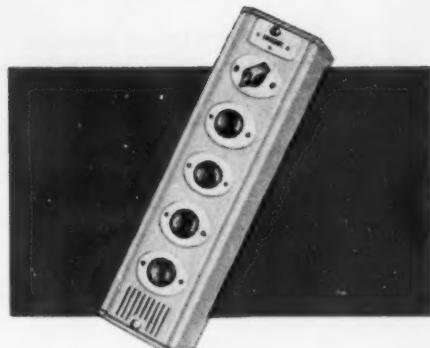
- Offers automatic control integrated with your process.
- Covers a wide speed range—forward or reverse.
- Starts, stops—fast or slow.
- Allows forward or reverse jogs.
- Controls one or more motors.

With a Century Performance Rated Selective Speed Drive, you can often integrate speed changes to cycle automatically as the process requirements dictate.

- You can automatically regulate metal cutting for optimum cutting speeds.
- Make the speed change automatically sensitive to changing temperature or pressure.
- Make the speed change automatically sensitive to changing diameter of a feed roll.
- Make the speed change automatically sensitive to the viscosity of a mix.
- You can use many different kinds of control devices in the control circuit to change speeds ... to jog ... to apply dynamic braking, etc.

You're welcome to full information on your specific drive problem. Call your nearest Century District Sales Office or Century Authorized Distributor, or write direct. See telephone listings.

Century makes A. C. and D. C. motors
1/8 to 400 H. P.



CENTURY ELECTRIC COMPANY

1806 Pine Street, St. Louis 3, Missouri
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Phelps Dodge

PERMA-DURE two or three conductor cable is insulated with Habirdure, glass wrapped. Conductors laid parallel under a Habirdure sheath. Sizes 14 through 10 AWG. Standard color is white. Underwriters approved as Type UF and Type NMC-600 volts.

PERMA-DURE single conductor is insulated with Habirdure (thermoplastic). Sizes 14 through 8 AWG (solid) and 6 through 4 AWG (seven strand). Standard color is black. Underwriters approved as Type UF-600 volts.



Multi-purpose

Perma-Dure!

An Economical, Dependable Cable for

- **Underground Wiring Including Direct Burial**
- **Interior Wiring**

PERMA-DURE, a Phelps Dodge product, provides electrical contractors with a durable, versatile type of flame-resistant cable for industrial and commercial use.

PERMA-DURE handles easily, strips readily and helps cut installation time and costs. It is supplied in single, two and three conductors for feeder or branch circuits. Under the 1953 National Electrical Code, *Perma-Dure* is recognized for installations as follows:

TYPE UF, single and multiple conductor, as feeder or branch circuit cable, for direct burial in the earth when provided with over-current protection.

TYPE NMC, multiple conductor (moisture and corrosion resistant non-metallic sheathed cable) for installation in exposed or concealed locations, in dry, damp or corrosive conditions; inside masonry or tile walls; or embedded, when suitably protected, in plaster and shallow chase in masonry.



**PHELPS DODGE COPPER PRODUCTS
CORPORATION**



Every Sola fluorescent ballast is noise-tested to assure quiet lighting installations

Quiet ballasts build business for fixture manufacturers and contractors . . . build client satisfaction for architects and consulting engineers. Sola Ballasts are quiet. Each ballast is individually tested with a crystal sound probe for acceptable noise level.

Of course every transformer has some hum, being a magnetic device. The difference in the hum level depends on design and construction methods. All Sola ballasts are built

with pressed-in core and coil construction for solidity. There are no loose parts to vibrate. Sola core design minimizes magnetic fields that tend to cause vibration. A well designed, carefully constructed ballast is usually a quiet ballast.

Test a Sola ballast and compare its operating qualities with other units. You can specify and install them with confidence. Write or phone for a Sola sales engineer to discuss your fluorescent lighting application.

SOLA *Fluorescent*
BALLASTS



Transformers for: Constant Voltage	•	Fluorescent Lighting	•	Cold Cathode Lighting	•	Mercury Vapor Lighting	•	Plastic Signs
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PITTSBURGH STANDARD
the only
**GALVANIZED
THREADS
ON HOT-DIP
GALVANIZED CONDUIT**

say goodbye

TO THREAD RUSTING WORRIES

Here's goodbye to the rusting of threads on hot-dip galvanized conduit... goodbye to rusting in storage... goodbye to time and money-consuming thread-cleaning on the job.

Hot-dip galvanized conduit with galvanized threads is the first bonus for you from the extraordinary new Pittsburgh Standard Morrisville Plant*—the world's most modern conduit mill.

Only Pittsburgh Standard offers this major bonus to you—and at no increase in price. Here's another reason why Pittsburgh Standard Hot-Dip Galvanized Conduit is "Standard of the Trade."

*Galvanized threads on all sizes from Morrisville, and on sizes 2½-in. and larger from Etna.



61 BRIDGE ST. PITTSBURGH 23, PA.

PLANTS AT MORRISVILLE & ETNA, PA.

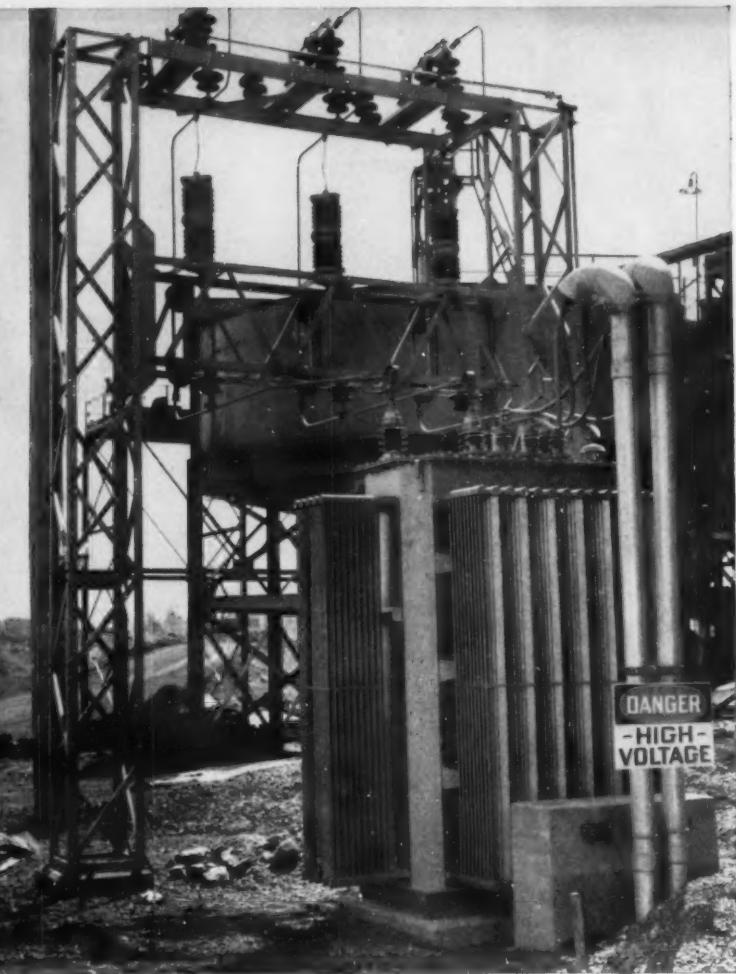
WHOLESALERS IN PRINCIPAL CITIES

Need immediate information on which to base bidding estimates and work schedules? Ask your Pittsburgh Standard agent. The unique Pittsburgh Standard Sales Control Center will enable him to give you immediate facts. Guesswork is eliminated and you're days and dollars ahead.

Wagner®

TRANSFORMERS
...the choice of leaders
in industry

POWER
for a
man-sized
job...



Taconite is an important word in the Mesabi Iron Country. As the supply of rich ore becomes scarcer, the mining companies are prepared to process taconite and lower grade iron ore for delivery to the nation's steel mills.

Processing taconite is a man-sized job. It is one of the world's hardest ores. It has to be crushed and ground to separate the iron particles from the rock and silica.

During the winter, the temperature in the Mesabi country often drops to 30° below zero. Tough jobs under operating conditions like this call for a plentiful supply of really dependable power. At the Nashwauk, Minnesota, mine of The Cleveland-Cliffs Iron Company, this power is delivered by Wagner Transformers. Shown above is the 3000 kva Wagner Power Transformer that furnishes power for this plant, and at the left is one of the Wagner 1000 kva Unit Substation Transformers that supply plant loads.

Wagner can also furnish motors especially designed for use in taconite plants. Your nearby Wagner engineer can help you select the right transformers or motors for *your* needs. Call the nearest of our 32 branch offices, or write us.



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6413 PLYMOUTH AVE., ST. LOUIS 14, MO., U.S.A.

ELECTRIC MOTORS
TRANSFORMERS
INDUSTRIAL BRAKES
AUTOMOTIVE
BRAKE SYSTEMS—
AIR AND HYDRAULIC

IF IT'S PARANITE® IT'S *the* RIGHT, Wire and Cable

PARAFLEX Non-Metallic Sheathed Cable lays flat. Won't squirm or twist. Clean to handle. Plainly marked.



PARAUSE® Type "RR" cable provides permanent underground installation from power line to meter and for connecting several buildings. CAA approved under Specification L824.



HYDRO-THERM® Building Wire combines in a single wire the heat-resistant qualities of Type RH and the moisture resistant qualities of Type RW.



URC Weatherproof Wire and Cable can be relied upon to meet severe climatic conditions. Both actual line and Weather-Ometer tests prove unusual ageing characteristics.



SERVICE ENTRANCE CABLE, Type SE Style U unarmoured and Type SE Style A armoured. There is also a Paranite Service Drop Cable, two conductor, Type SD.



DREADNAUGHT® Heavy Duty Cable has lead-cured neoprene insulation. Flexible, durable, safe, long-lived. Cuts repairs and replacements, Delivers current continuously.



IF IT'S PARANITE® IT'S RIGHT!



PARANITE WIRE AND CABLE
Division of **ESSEX WIRE CORPORATION**
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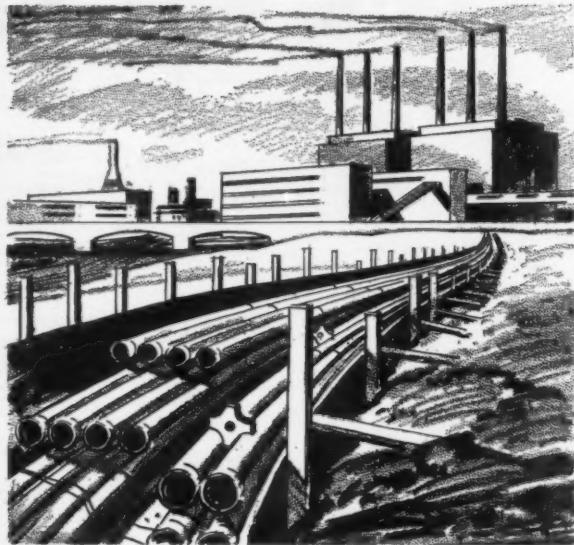
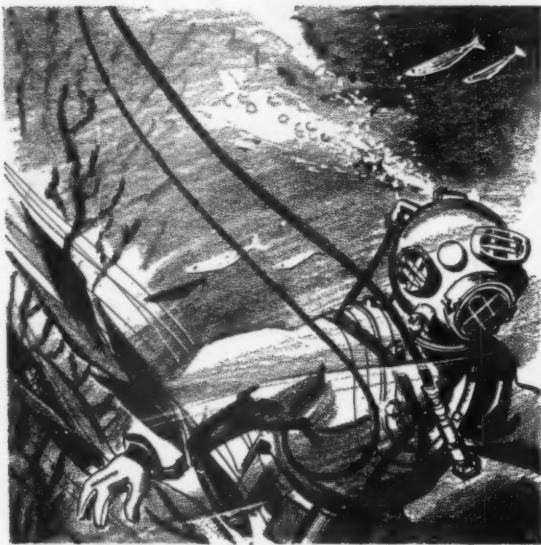


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ELECTRICAL WIRES AND CABLES "BETTER THAN CODE REQUIRES"

LIFE LINES



Oxygen lines are the life lines of every diver!

Electric cables are the life lines of every community!

Orangeburg Fibre Conduit gives cables complete underground protection!

ELECTRICAL CABLES...the *life lines* through which power flows into every community's homes, offices and plants...must have the fullest and the longest protection possible. And that is what they get in the underground ducts with Orangeburg Fibre Conduit.

This is a fact so well understood throughout the electrical industry that Orangeburg Fibre Conduit is a first choice of Public Utilities, Municipalities, Industries and Electrical Contractors everywhere.

The reasons for Orangeburg's High Quality! Tough, strong, resilient, non-metallic...Orangeburg Fibre Conduit does not crack or break. Its impermeable walls and tight joints bar out corrosive ground waters. Its smooth bore and low coefficient of friction protect cable sheaths from abrasion while going *in* and *after they are in* the duct. Orangeburg material resists acids, alkalies, salt, grease, oil. The net result: a *longer-lived raceway for longer cable life*.

Check these cost-saving advantages... Light weight . . . long lengths . . . readily assembled joints . . . angle

couplings, bends and other Orangeburg standard fittings . . . these are some of the reasons why Orangeburg Fibre Conduit is so quick, easy and economical to install. Send to Dept. EC74 for more facts.

ORANGEBURG MANUFACTURING CO., INC.

ORANGEBURG, NEW YORK

West Coast Plant, Newark, Calif.



ORANGEBURG FIBRE CONDUIT
STANDARD with concrete encasement NOCRETE without concrete encasement

Graybar
ELECTRIC COMPANY

BRANCHES AND STOCKS IN PRINCIPAL CITIES

DISTRIBUTORS,
ORANGEBURG
FIBRE CONDUIT

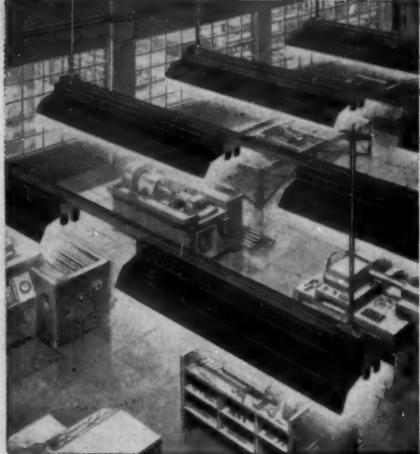
GENERAL ELECTRIC
SUPPLY COMPANY

A Division of General Electric Distributing Corporation

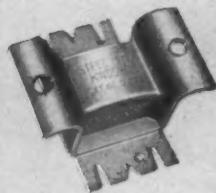
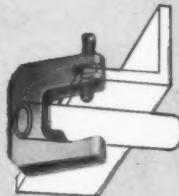
KINDORF CLAMPS, HANGERS and CONCRETE INSERTS



for Supporting
CONDUIT
LIGHTING
FIXTURES
and
ELECTRICAL
EQUIPMENT



Are Designed for Doing Better Jobs Quicker



ELECTRICAL BOXES AND
CONDUIT FITTINGS

The time saving and complete KINDORF Line provides Hangers and Supports for

Suspending Single and Multiple Runs of Conduit

Channel and Fittings for Racks, Frames and Hanger Supports

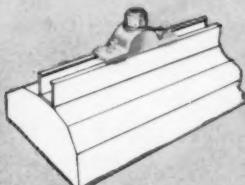
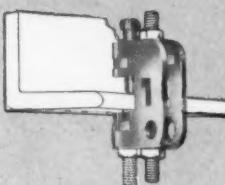
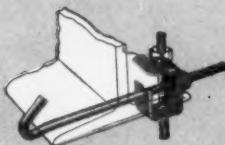
Spot Type and Continuous Concrete Inserts

Channel and Fittings for a Safe, Economical and Practical Method of Hanging Fluorescent Fixtures



**STEEL CITY
ELECTRIC CO.**

PITTSBURGH 33, PENNSYLVANIA

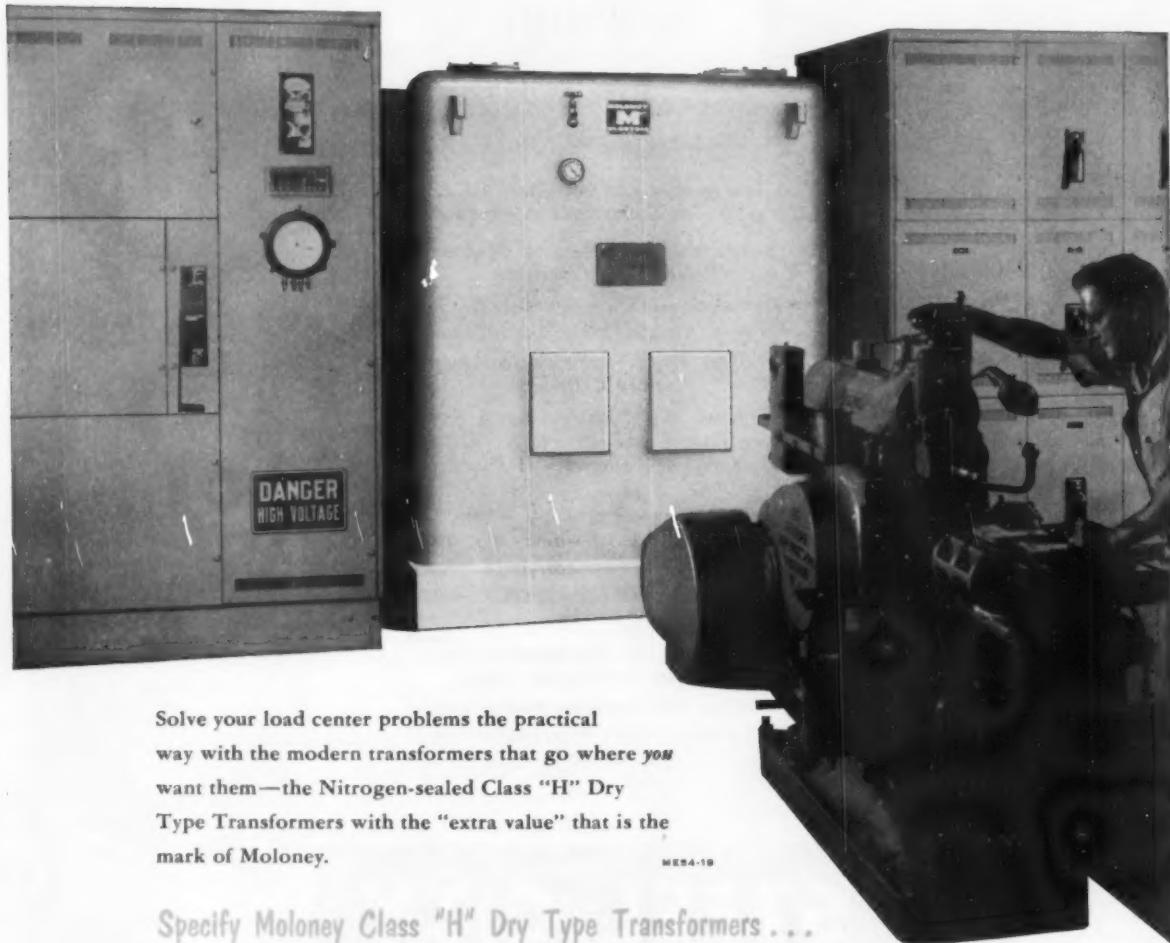


KINDORF CHANNEL CLAMPS and HANGERS

Eliminate Maintenance

Since Moloney Class "H" insulated Dry Type Transformers are nitrogen-sealed, maintenance is eliminated. They cannot produce toxic gases, never need expensive vault installations and the nitrogen atmosphere protects insulation from oxidizing. This results in longer, more dependable transformer life.

Moloney Nitrogen-sealed Class "H" insulated Dry Type Transformers offer you more protection against fire and explosion hazards. These versatile and dependable transformers can be located indoors or outdoors *right next to the job* and more than meet the most exacting insurance requirements. And this also means important savings in costly copper connections . . . less danger of accidental power interruptions.



Solve your load center problems the practical way with the modern transformers that go where *you* want them—the Nitrogen-sealed Class "H" Dry Type Transformers with the "extra value" that is the mark of Moloney.

MES4-19

Specify Moloney Class "H" Dry Type Transformers . . .

M O L O N E Y E L E C T R I C C O M P A N Y



Power Transformers • Distribution Transformers • Step Voltage Regulators • Regulating Transformers • Load Ratio Control Transformers • Unit Substations • Network Transformers • Constant Current Transformers • Capacitors • Transformers For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

FEEDRAIL® Trolley Busways

Handy Selection Guide



FEEDRAIL "60"

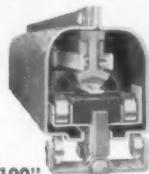
Applications: Budget hoists, light tonnage monorails, small portable tools, lighting, cutting and sewing equipment.

Capacity: Continuous current rating—60 amperes; 250 volts A.C. or D.C.; 2 or 3 pole.

Track: Plain, curved, door, sectionalizing and transfer sections.

Trolleys: 15 Amperes, fusible and non-fusible. New special service 20 ampere fusible and non-fusible trolleys for use with budget hoists and monorails. 8 ampere plug-in jacks for stationary service.

Additional data in Bulletin No. 45.



FEEDRAIL "100"

Applications: Cranes and hoists, portable tools, production and test lines, machine tools, airport hangar doors.

Capacity: Continuous current rating—100 amperes; 575 volts A.C. or 250 volts D.C.; 2 or 3 pole.

Track: Plain, curved, door, sectionalizing and transfer sections.

Trolleys: 20 and 30 ampere fusible and non-fusible types, with and without receptacles, to meet a wide range of requirements. Non-fusible crane and hoist trolleys in 30, 60 and 100 ampere capacities.

Additional data in Bulletin No. 40.



FEEDRAIL "HEAVY DUTY"

Applications: Heavy duty cranes and hoists, large machine tools, conveyor assembly lines.

Capacity: Continuous current rating—225, 375 and 500 amperes; 575 volts A.C. or 250 volts D.C.; 2 or 3 pole.

Track: Plain, door and expansion sections.

Trolleys: 225 amperes with bottom-or side outlet.

Additional data in Bulletin No. 35.



Feedrail is the safe, dependable way to distribute electrical power to moving or stationary equipment.

The modern Feedrail Trolley Busways eliminate the problems and troubles of open wiring, accidental contact, and long trailing cables. All current-carrying components are protected by sturdy steel housings. Easy rolling trolley outlets, supported by the protective track housing, take off power from the bus bars at any point along the length of a run. There's no chance of broken conductors suddenly interrupting operation. The entire installation is compact, out of the way and trouble-free.

Track, trolleys and accessories are soundly engineered and built to high precision standards that mean long life. Its design includes every provision for fast, easy installation — maximum safety and dependability.

FOR FULL DETAILS write for descriptive literature. We can help you better if you state your requirements. Address Dept. C-7.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST

G4-1

ELECTRIC
FEEDRAIL

Never Becomes Obsolete

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

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SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

Use this unconditional lighting fixture warranty to promote business

This seal helps you promote new lighting business . . . and automatically opens the door to other electrical improvements. It has merchandising power: it advertises, demonstrates, proves and helps sell your own high standards of quality.

Good lighting helps build reputation. It's an electrical improvement the public *sees and talks about*. It takes just one outstanding lighting improvement in a business block, and others soon follow.

That's why you don't take chances. You guarantee your work—and we have no hesitation in backing you *all the way*. That's why the Westinghouse lighting fixture warranty is for the *exclusive use* of electrical contractors who guarantee their work. You name the terms—we'll back you up.

J-04351



Get This Merchandising Package; Today!

Get your personal copy of the Westinghouse warranty package. Warranty covers the entire line of commercial, industrial and floodlighting fixtures (lamps, starters and labor not included).

Westinghouse Electric Corporation
Lighting Division
Cleveland, Ohio

Please send my personal copy of warranty package.

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Company _____

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Warranty
LIGHTING FIXTURES
good for the life of your contractor's
guarantee

Business-building ideas, personalized direct mail
and practical installation tips on how to build
sales, profit and prestige through lighting.

Dependability is what you want in tapes— “Made by U. S. Rubber” means Dependability

Reinsulating and splicing with U. S. Tapes restore a cable or wire to its original dielectric strength and efficiency. They are made by United States Rubber Company, the only tape manufacturer to grow its own natural rubber and make its own synthetic rubber and plastics. “U. S.” has amassed years of experience, research data and skill

in the manufacture of tapes that guarantee *dependability* in *any* one of the tapes in the “U.S.” Line.

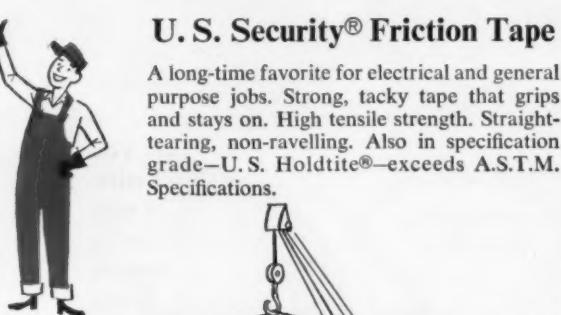
Because the “U.S.” Line is complete, you can simplify purchasing by ordering from this *single* line. Order from a selected “U.S.” Distributor or any of the 27 “U.S.” District Sales Offices.



U. S. Security Rubber Tape

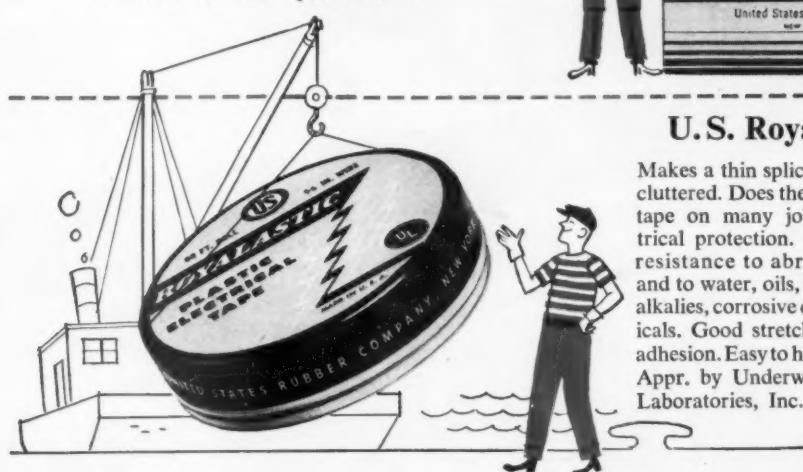
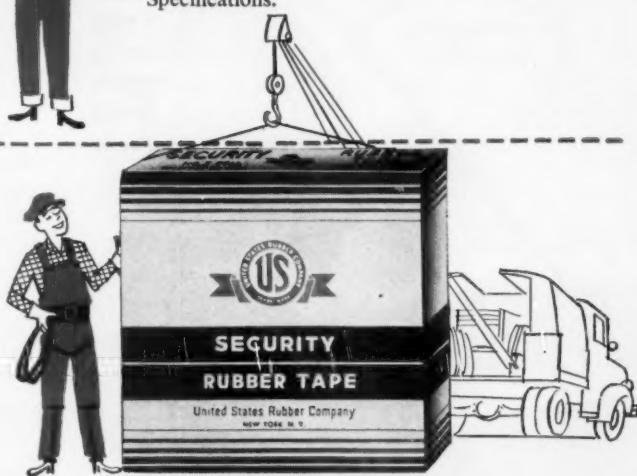
For electrical work. Handles easily and fuses without heat. An unvulcanized rubber splicing compound; Security has high tensile strength, stretch, tackiness, high dielectric strength.

Also in a specification grade—U. S. Holdtite—exceeds A.S.T.M. Specifications.



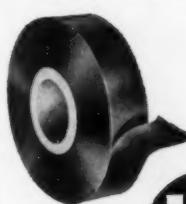
U. S. Security® Friction Tape

A long-time favorite for electrical and general purpose jobs. Strong, tacky tape that grips and stays on. High tensile strength. Straight-tearing, non-ravelling. Also in specification grade—U. S. Holdtite®—exceeds A.S.T.M. Specifications.



U. S. Royalastic Plastic Tape

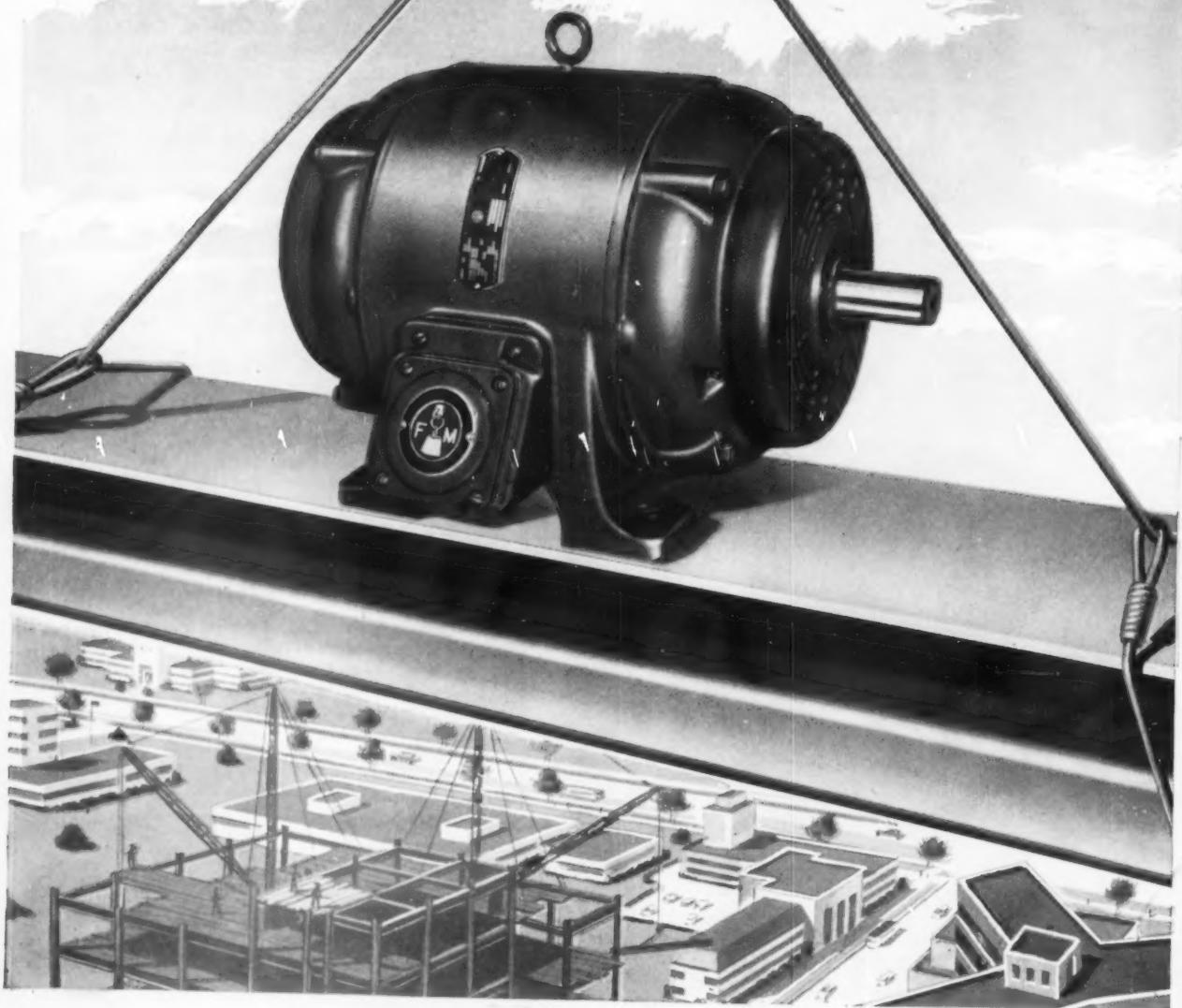
Makes a thin splice that leaves wiring neat and uncluttered. Does the work of both rubber and friction tape on many jobs. Complete mechanical, electrical protection. Good tensile strength and high resistance to abrasion and to water, oils, acids, alkalies, corrosive chemicals. Good stretch and adhesion. Easy to handle. Appr. by Underwriters' Laboratories, Inc.

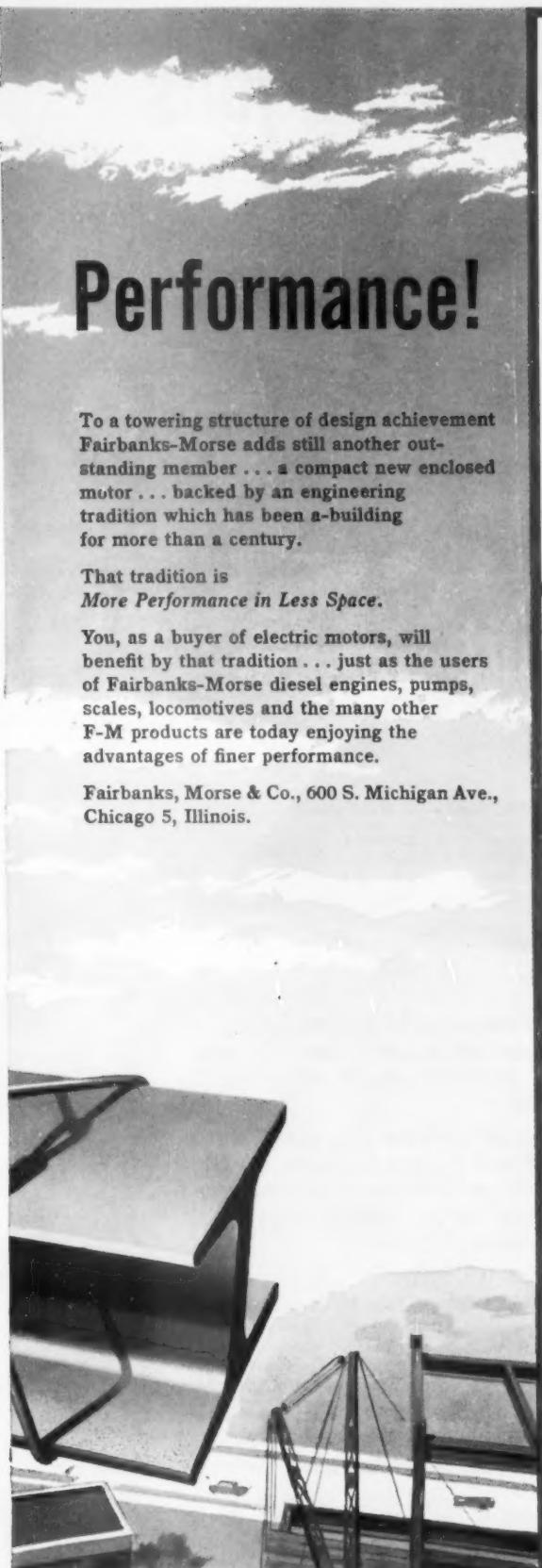


UNITED STATES RUBBER COMPANY
MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

GOING UP...

Electric Motor





Performance!

To a towering structure of design achievement Fairbanks-Morse adds still another outstanding member . . . a compact new enclosed motor . . . backed by an engineering tradition which has been a-building for more than a century.

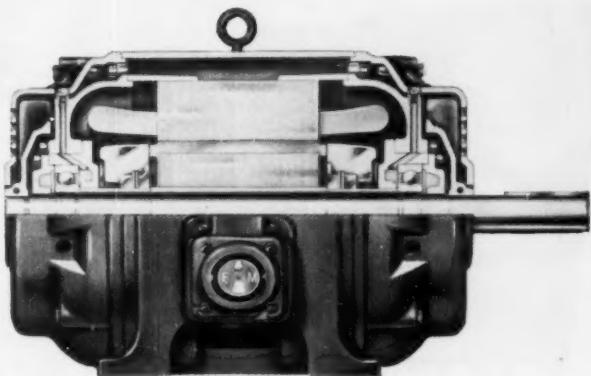
That tradition is

More Performance in Less Space.

You, as a buyer of electric motors, will benefit by that tradition . . . just as the users of Fairbanks-Morse diesel engines, pumps, scales, locomotives and the many other F-M products are today enjoying the advantages of finer performance.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Illinois.

NEW FAIRBANKS-MORSE TOTALLY ENCLOSED FAN-COOLED MOTORS



TOTALLY ENCLOSED—Wherever adverse operating conditions are encountered, F-M totally enclosed construction effectively insures electrical parts and bearings against contamination by dirt, abrasive dusts, metal particles, corrosive gases and steam.

DOUBLE-END VENTILATION—Cooling air is drawn through guarded openings in both fan shields and uniformly circulated through cored passages surrounding the sealed inner shell. Efficient heat-transfer action insures uniform internal cooling. Exhaust air is discharged through bottom of frame—not across motor and driven machine.

COPPERSPIN ROTOR—Exclusive Fairbanks-Morse feature—an indestructible one-piece rotor—homogeneous, free from flaws for maximum strength and lifetime service.

CONDUIT BOX—New, gasketed, cast iron conduit box permits easy pulling of cables without insulation damage. Fairbanks-Morse exclusive: recess feature allows elimination of conduit box where space is limited.

BEARINGS—Precision ball bearings are effectively sealed against grease leakage and contain ample lubrication for extended periods of rugged service. Convenient means are provided for flushing and relubricating if desired. Cartridge bearing construction is standard on all larger ratings.

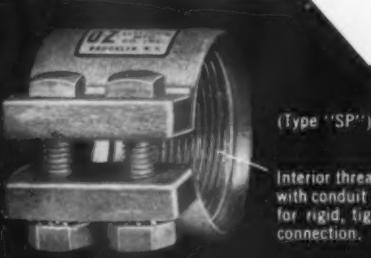


FAIRBANKS-MORSE

a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES
AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER
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"TOUGH" conduit coupling jobs

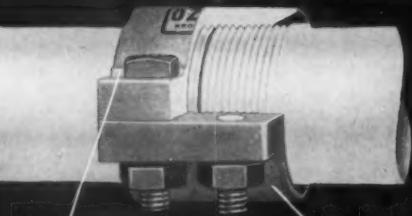


(Type "SP")

Interior thread meshes with conduit threading for rigid, tight-fitting connection.

are easy with O. Z.

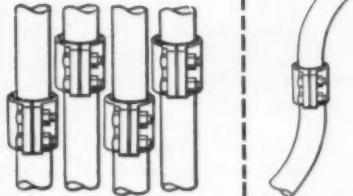
split couplings



Bolt heads are held in place by shoulder on coupling, eliminating need for second tool.

One piece malleable iron construction facilitates handling during installation.

To install, simply slip over one conduit end, butt ends of both conduits, slide fitting back into position and tighten nuts.



* "Tough" - (Where ordinary couplings can't be installed). Are clearances close - near floor, wall, ceiling or other obstructions? Can conduits be turned due to bends? Is space or accessibility a factor? Just install an O.Z. Type "SP" Split Coupling.

Butt the conduit ends within the O.Z. Split Coupling — tighten two nuts with an ordinary open-end wrench and presto . . . you have a permanent, close-fitting, rigid connection.

Drastically reduced installation costs, plus initial savings of as much as 50% in larger sizes, over similar competitive fittings, are just two of the many reasons why you should specify O.Z. Split Couplings for your difficult conduit coupling jobs.

Call your local O.Z. distributor . . . he is ready to make immediate delivery from stock on sizes from $\frac{1}{2}$ " to 5".

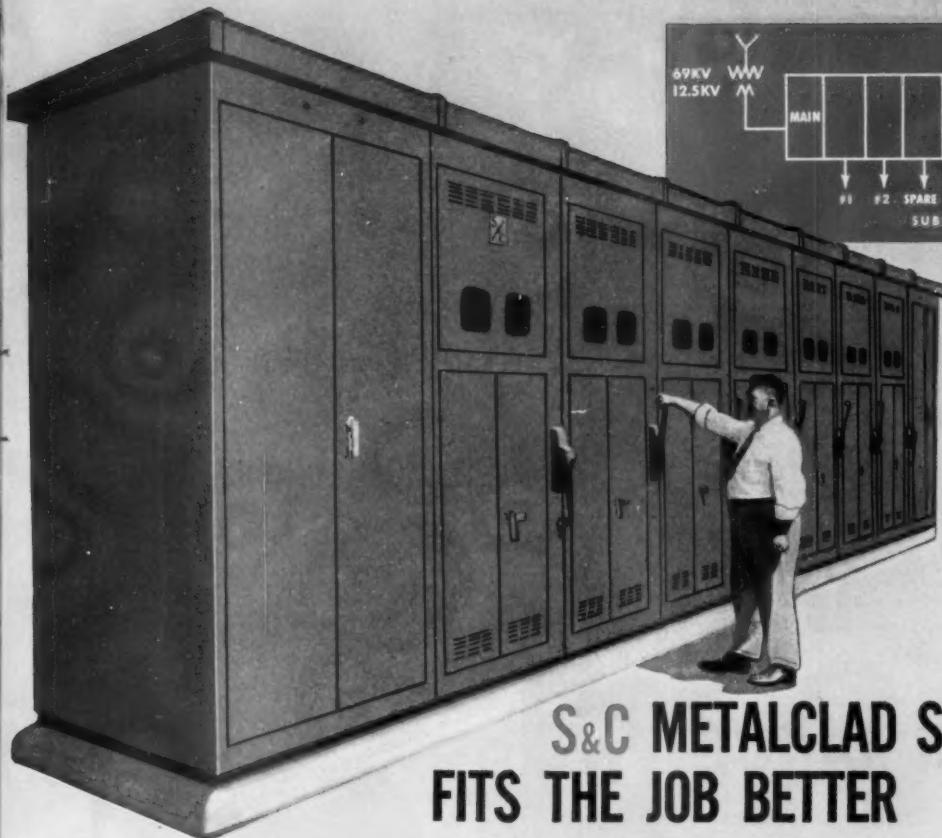


O.Z.

ELECTRICAL MANUFACTURING CO., INC.

262 BOND ST. • BROOKLYN 17, N.Y.

CAST IRON BOXES • SOLDERLESS CONNECTORS
CABLE TERMINATORS • GROUNDING DEVICES
POWER CONNECTORS • CONDUIT FITTINGS



**THIS S&C
METALCLAD SWITCHGEAR**

is part of Whirlpool's distribution system. Electric service is brought in at 69 KV. Two transformer banks deliver power at 12.5 KV to this double-ended switching center. Four feeders supply load centers which serve various areas of the plant with 440-volt power. Two additional feeders are spares for future use. A tie switch in the center bay, normally open, permits all feeders to be supplied from one transformer only under emergency conditions.

S&C METALCLAD SWITCHGEAR FITS THE JOB BETTER

...and it saves half the cost!



ROBERT L. PFEIL
is Secretary and Assistant Construction Superintendent of Koontz-Wagner. He says, "Our work is almost altogether connected with industrial plants and public buildings. Because of our long and valuable experience in this field, we prefer to do our own engineering, and give our customers full advantage of our experience and know-how. We thus can be sure that the installation is entirely adequate, and frequently we are able to make substantial savings, as we did at Whirlpool."



When Whirlpool Corporation recently acquired a plant in LaPorte, Ind., for the manufacture of aircraft parts, a new electric service had to be provided to meet the new requirements.

Koontz-Wagner Electric Co., Inc.—contractor-engineers of South Bend—were assigned to engineer and install the necessary equipment.

As part of the main substation, Koontz-Wagner selected S&C Metalclad Switchgear to provide fault protection and switching . . . because investigation showed it was not only adequate for every need, but that alternate equipment would have been larger and more cumbersome, required more ground area, a larger pad, and would have cost more to install and maintain.

With S&C Switchgear the cost was less than half; and now there are no batteries to maintain, no oil to change.

Information about S&C Switchgear is contained in this booklet . . . we would like to send you a copy.

S&C Electric Company
4433 Ravenswood Ave., Chicago 40, Illinois

Please send me your new booklet on S&C Metalclad Switchgear. No obligation on my part, of course.

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____



COMPARE



LEV-O-LOCK devices on these **3** points . . .

1 QUALITY

LEV-O-LOCK devices are unexcelled. Leviton makes sure every part is made and quality-controlled within the plant. Most rigid tests and standards have to be met! Listed by UL and CSA.

2 PERFORMANCE

Outperforms all others on basis of actual laboratory tests. Sturdy phenolic stands up even in roughest applications. Receptacles feature double wiping contacts, made of heavy, wear-resistant phosphor bronze. Wiring is faster, simpler — extra large binding screws make it so! It's easy to change over to LEV-O-LOCK devices. They're interchangeable with other standard locking-types.

3 PRICE

Leviton buys huge quantities of the best in raw materials — then mass produces every component part of every product to precise Leviton standards . . . whether it's small screws or metal plates. The result? LEV-O-LOCK is a truly precise, superior product — at a trim price that defies competition!

Why pay more when the best costs less?

your best jobs are done with . . .



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Chicago, Los Angeles • Leviton (Canada) Limited, Montreal
For your wire needs, contact our subsidiary
AMERICAN INSULATED WIRE CORPORATION

PUSH—TURN—AND IT'S LEV-O-LOCKED



Receptacle



Receptacle on Plate



Cap



Cord Connector

Available in 2, 3 and 4 wire Caps,
Connectors and receptacles in 10 and 20
AMP. ratings.



THE NEW CUTLER-HAMMER UNIT BREAKER

Modern Low-Cost Circuit Protection

The new Cutler-Hammer Unit Breaker—the Unit System Circuit Protector—has everything you want—low price, top convenience in stocking, in selecting proper circuit breaker capacities for a specific home or other buildings, rapid, easy installation and wall-switch snap-on, to restore service.

The Cutler-Hammer Unit Breaker is 3 simple components. The case with bus bar assembly. The individual circuit breaker in 15, 20, 30, 40 and 50 amp. capacities that the contractor just picks out and pushes in. And the cover for flush or surface mounting. 6 case sizes handle any circuit combination from 1 to 32 circuits. There are many other features too—plus genuine *Cutler-Hammer quality* at new low prices.

See this new Unit System Circuit Protector. Get the whole story including the new pocket size Handilog and selector charts. Don't delay. Cash in. Contractors, see your authorized Cutler-Hammer distributor *today*. CUTLER-HAMMER, Inc., 1306 W. St. Paul Avenue, Milwaukee 1, Wisconsin.





Basically 3 Components
The C-H Unit Breaker consists of case, individual circuit breakers, and cover. Easy to assemble, and install.



6 Cases—32 Circuits
Only 6 case sizes handle all needs to 32 circuits. Also raintight and special types available.

**Rock Bottom Prices
Plus These Features**

Ambient compensated. No pre-tripping in hot climates. Thermal magnetic protection against heavy overloads and shorts. Compact, rugged, lasting, dependable. Quick make and break for long contact life. Famous C-H Quality.



For many years Contractors from Coast to Coast have used Briegel All Steel Indenter Fittings. U. L. approved as concretetight and for general use, B-M Indenter Fittings are faster, easier to use and neater in appearance.

Installation is simple and less expensive. Two quick squeezes sets them forever. Try B-M Indenter Fittings and get more profits from each job!



BRIEGEL
METHOD
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CO.
GALVA, • ILLINOIS

Warehouse Stocks in Principal Cities for Immediate Delivery!

*Four Steps That Mean
Easier, Quicker, Safer Installation of*

CRESCE NT A B C ARMORED CABLE



1 FILE OR SAW
CABLE BY CUTMARK



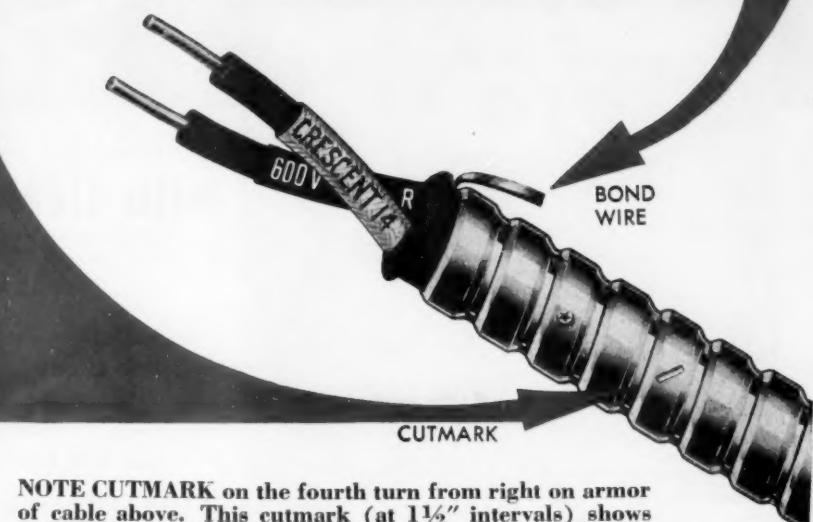
2 BREAK ARMOR



3 PULL OUT PAPER



4 INSERT INSULATING
BUSHING



NOTE CUTMARK on the fourth turn from right on armor of cable above. This cutmark (at $1\frac{1}{2}$ " intervals) shows the location of a prefabricated breaking line inside the armor. Only a few strokes of a file or saw guided by the cutmark, are required to cut through one outer ridge, and a bend by hand severs the armor. This results in a clean separation with no sharp edge—a safer, easier and faster job. The prefabricated breaking lines are so designed that there is no reduction in tensile strength, bending quality, crushing resistance and electrical conductivity of armor.

NOTE BOND WIRE UNDER ARMOR which is in contact with the under side of each convolution. This provides permanently low armor resistance. It is furnished in sizes No. 14 and 12 AWG Cable.

GENUINE ABC CONSTRUCTION provides for easy insertion of the insulating bushing because the paper under the armor readily *unwraps from under both ends* providing space to insert the bushing.

ALL GLASS BRAIDS protect the rubber insulated conductors, and are flame, moisture and rot proof. The use of ALL GLASS braid results in a cable with smaller diameter and lighter weight, being easier to handle and install.



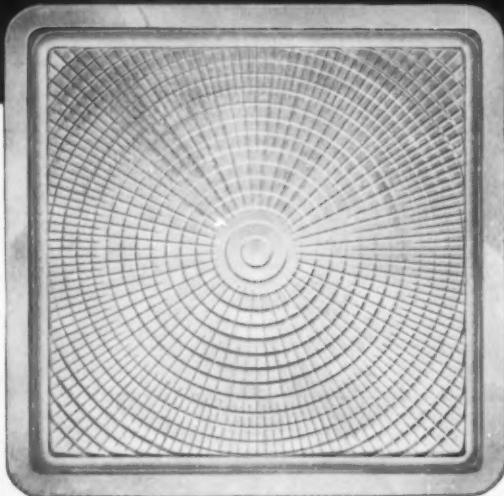
CRESCE NT WIRE & CABLE



CRESCENT INSULATED WIRE & CABLE CO.

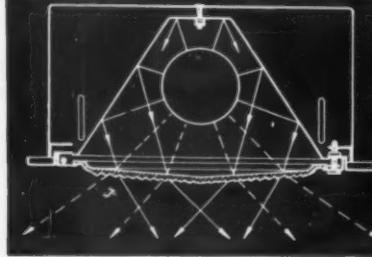
TRENTON, N. J.

ART METAL advanced ELIPTISQUARE

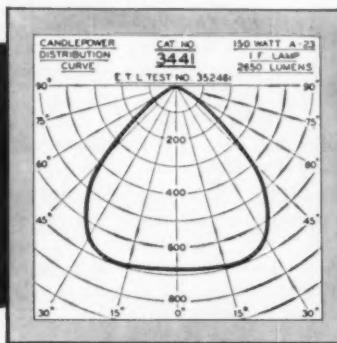


advanced ELIPTISQUARE

Multiples Light Output



Eliptisquare reflector redirects all box-enclosed light downward through AMCOLENS to multiply lamp light utilization.



Please notice
that the candle-
power distribu-
tion curve is by
Electrical Test-
ing Laborato-
ries, Inc., not The
ART METAL
Company.

May we send Bulletin 254 which gives complete details?
Please write.

THE **ART METAL** COMPANY
CLEVELAND 3, OHIO

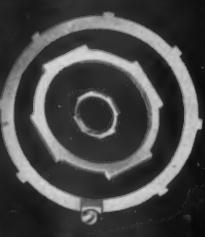
Manufacturers of Engineered Incandescent Lighting

ANY FITTING YOU CAN THINK OF!

**Gedney's got it...in malleable iron...accurately machined
...quickest, least costly to install**

IT'S RIGHT THERE in the Gedney line...every fitting that you need for every sort of installation! And Gedney fittings are accurately machined and threaded...made of unbreakable malleable iron...

individually inspected to assure you the lowest installed costs obtainable today! Always order Gedney fittings and you'll *always* make maximum savings of time and money.

	CONDUIT LOCKNUTS — sizes from $\frac{3}{8}$ " to 6". Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ " are made of heavy nut lock steel... all other sizes, malleable iron. All sizes cadmium plated. Also bonding wedge locknuts, $\frac{1}{2}$ " to 6".		3-PIECE CONDUIT COUPLINGS — come in a large range of sizes from $\frac{1}{2}$ " to 6". Malleable iron, cadmium plated.
	CAPPED BUSHINGS — available in a standard range from $\frac{1}{2}$ " to 6". Made of unbreakable malleable iron, cadmium plated.		PIPE STRAPS — CLAMP BACKS and NEST BACKS — 1 hole—for rigid E.M.T. and service entrance cable. Available in a full range of standard sizes. Malleable iron, hot dip galvanized.
	CORNER PULL-IN ELBOWS — made in $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1", $1\frac{1}{4}$ ", $1\frac{1}{2}$ ", and 2" sizes. Outstanding for space saving, machine wiring, easy wire pulling. Malleable iron, cadmium plated.		NAIL STRAPS — for rigid E.M.T. and S.E. cables with O.D. of .706 to 1.163 inches. In sizes $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1". Malleable iron, cadmium plated.



GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY



RKO BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

Modernize Distribution Systems

with SORGEL Air-Cooled Transformers

**Increase feeder capacity by transmitting electric power
to load centers at higher voltages**

The Most Practical Type Transformers to Reduce Voltage at Load Centers

Air-cooled dry-type transformers are the most practical type for indoor installations, and it is important that the transformers are of the best quality — SORGEL transformers. They require little or no maintenance; no liquid to check or replenish; no fire hazard; small and compact; economical; easy and convenient to install; no vault required.

Increased Efficiency

Sorgel air-cooled dry-type transformers are so quiet in operation that there is no disturbing hum; therefore, they can be installed in almost any convenient place inside of buildings, close to the load center. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Easy and Low Cost Installation

All self-contained in a single unit. Three-phase transformers are also in a single unit, with simple connections to make. No separate mounting brackets or junction boxes to make or buy. Substantial wall brackets, with slots for bolts, or floor mounting base, are an integral part of Sorgel transformers. Roomy connection compartment with wide choice of knock-outs. All transformers are equipped with solderless terminal lugs and permanent connection diagram.

Liberal Design for Full Rated Load

Sorgel transformers are guaranteed to carry the full rated load continuously. They are so liberally designed that they can safely carry an overload during an emergency.

Large Variety for Every Purpose

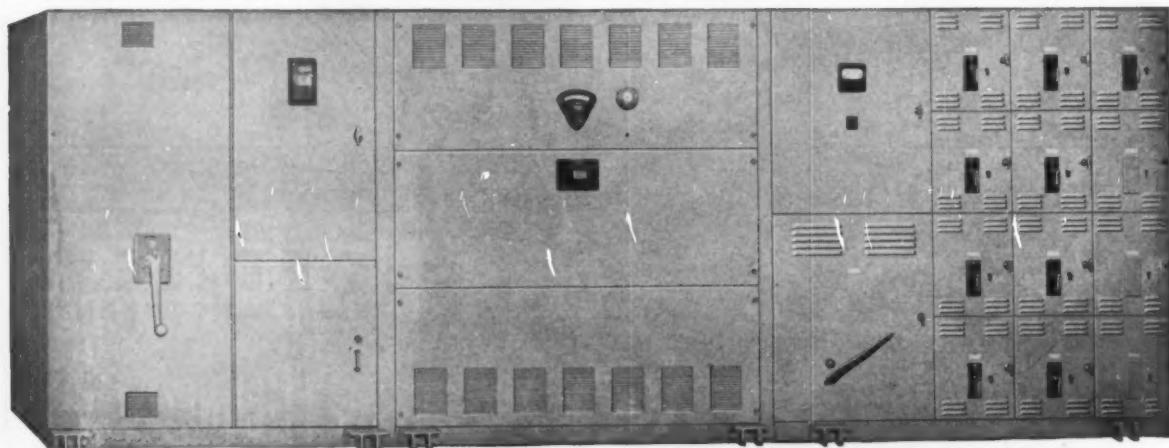
These transformers are available in a large variety of sizes and types for every purpose. $\frac{1}{4}$ Kva to 1000 Kva single phase, 1 Kva to 3000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltages.



1 to 10 Kva 3-phase

A Perfect Partner for Substations

Sorgel transformers can also be incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.



Unit substation, with primary switchgear—metering—2000 Kva 3-phase, 13,200 volt transformer—secondary circuit protection.
Shipped completely assembled, wired and tested, ready to connect to lines. Nothing else to buy, make, or assemble.

SORGEL ELECTRIC CO., 836 West National Ave., Milwaukee 4, Wis.

This low-priced Type B Time Switch has everything you want... INCLUDING SANGAMO QUALITY!



STANDS ROUGH HANDLING

Sturdy, attractive, all-steel case. Hinged cover. Sealable hasp. No glass window to break. Height: 7 1/4", depth: 3 1/4", width: 4 1/4".

INSTALLS EASIER

Case is designed so there's wiring room in almost one-half of the inside space (see illustration). This feature, plus 1/2" to 3/4" multiple knock-outs and a keyhole slot in the back makes for neat, fast, low-cost installation.

ANYONE CAN OPERATE IT

Setting the dial is simple. There are two "on" and two "off" levers. Tripers are easily set. Can be tripped by hand without interrupting the automatic operation.

DEAD FRONT SAFETY

A dead front insulating shield eliminates the shock hazard. No contacts or wiring are exposed.

LASTS LONGER

The type B has the famous Sangamo slow-speed motor...the same motor used in Sangamo heavy duty switches...that stops service calls because it never stops...even in coldest winter or hottest summer.

INSTALL IT AND FORGET IT

NEMA Standard 30 ampere rating. Long-life silver contacts of "minimum arc" design assure maximum performance. Carries the same liberal, 18-months guarantee as any other Sangamo time switch.

For years, Sangamo time switches have been the choice of the man who demands dependability in electrical equipment...the electrical contractor. He knows "Sangamo stands for quality." Even when a low-priced time switch is called for—you want a switch that will spare you the wasted expense of call-backs due to, let's say, motor failure or jammed levers, burned contacts or stuck dials. You want performance...a switch you can install and forget. A switch that

will go on working without constant attention.

With these things in mind, Sangamo engineers designed the NEW Sangamo Type B, which offers you everything you want in a time switch, plus Sangamo Quality—quality you can trust. And all at a NEW, *low price!*

See this sensational value at your electrical wholesaler's NOW. Try it and when you do, you'll wipe out the service call headache and the need for defective switch replacement.



SANGAMO ELECTRIC COMPANY

GET ON THE

For
building
lighting
business

The Competition closes on December 1st

Lighting Competition Chairman
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd Street, New York 36, N. Y.

I'm not going to miss the boat. Send me the Rules Brochure and
Entry Forms.

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COMPANY _____

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BEAM

enter the
Light's
Diamond Jubilee
lighting
competition
for electrical
contractors . . .

. . . with one or more of the following types of lighting installations: Stores, Schools & Offices, Industrials, Residential, Flood-lighting, Miscellaneous (hospitals, banks, lobbies, etc.)

- ★ \$1350 in cash awards
- ★ Publication of winning first prize entries
- ★ Free reprints of published first prize articles for local sales promotion

**ELECTRICAL
CONSTRUCTION
AND MAINTENANCE**

A McGRAW-HILL PUBLICATION
330 WEST 42nd STREET, NEW YORK 36, N. Y.



Fast Service

for Dry-Type Transformers

A phone call delivers Allis-Chalmers quality transformers! Stocks of the most popular sizes and ratings of A-C dry-type transformers are located near you. And your local A-C representative is prepared to give you immediate action.

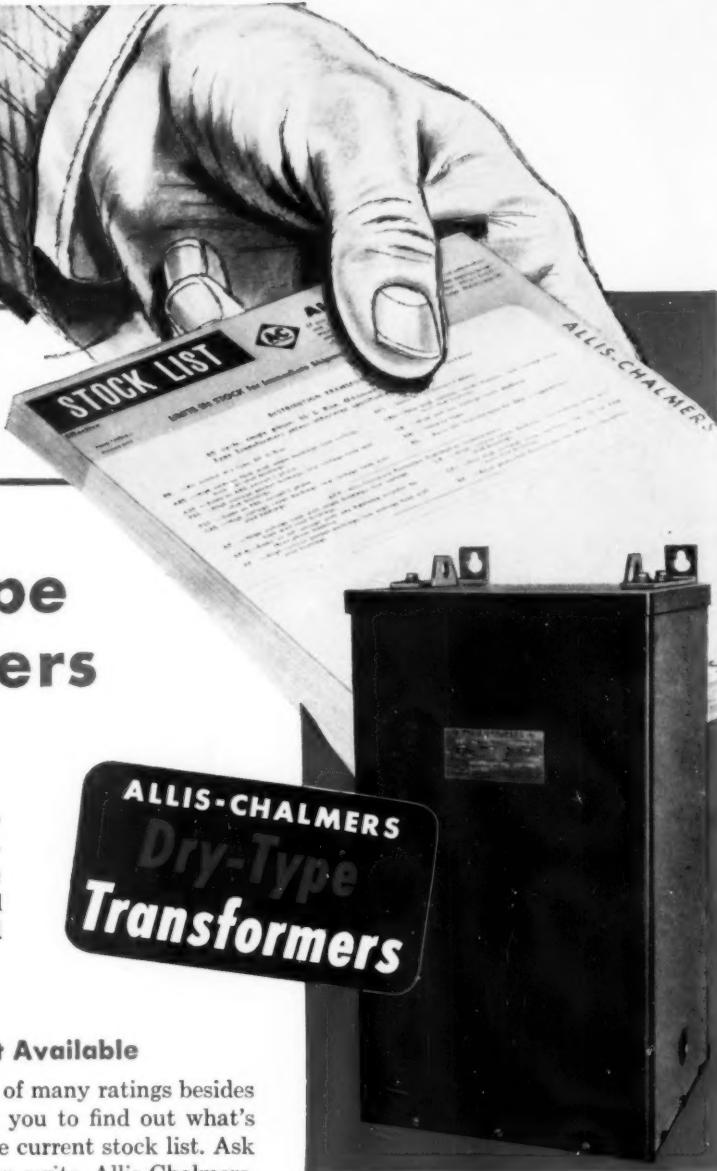
Current Stock List Available

Stocks usually include dry-types of many ratings besides those most popular. It will pay you to find out what's available by getting a copy of the current stock list. Ask your own A-C representative or write Allis-Chalmers, Milwaukee 1, Wisconsin.

Completely enclosed design. Ratings are single-phase sizes 10 kva and smaller; three-phase sizes 15 kva and smaller, 600 volts and below. Standard construction for small low voltage transformers. Recommended for indoor or outdoor applications—operate well in dusty or lint-filled atmospheres. Solderless connectors speed installation. Mount them on wall or post—no vault needed.

Openly ventilated transformers. Ratings are single-phase 15 kva and larger; three-phase 30 kva and larger, 15 kv and below. Designed for indoor use. Easy to hook up—most sizes have solderless connectors. Cooling air flows in through base openings through windings to maintain low temperature rise. Coils are impregnated to protect against dirt and moisture.

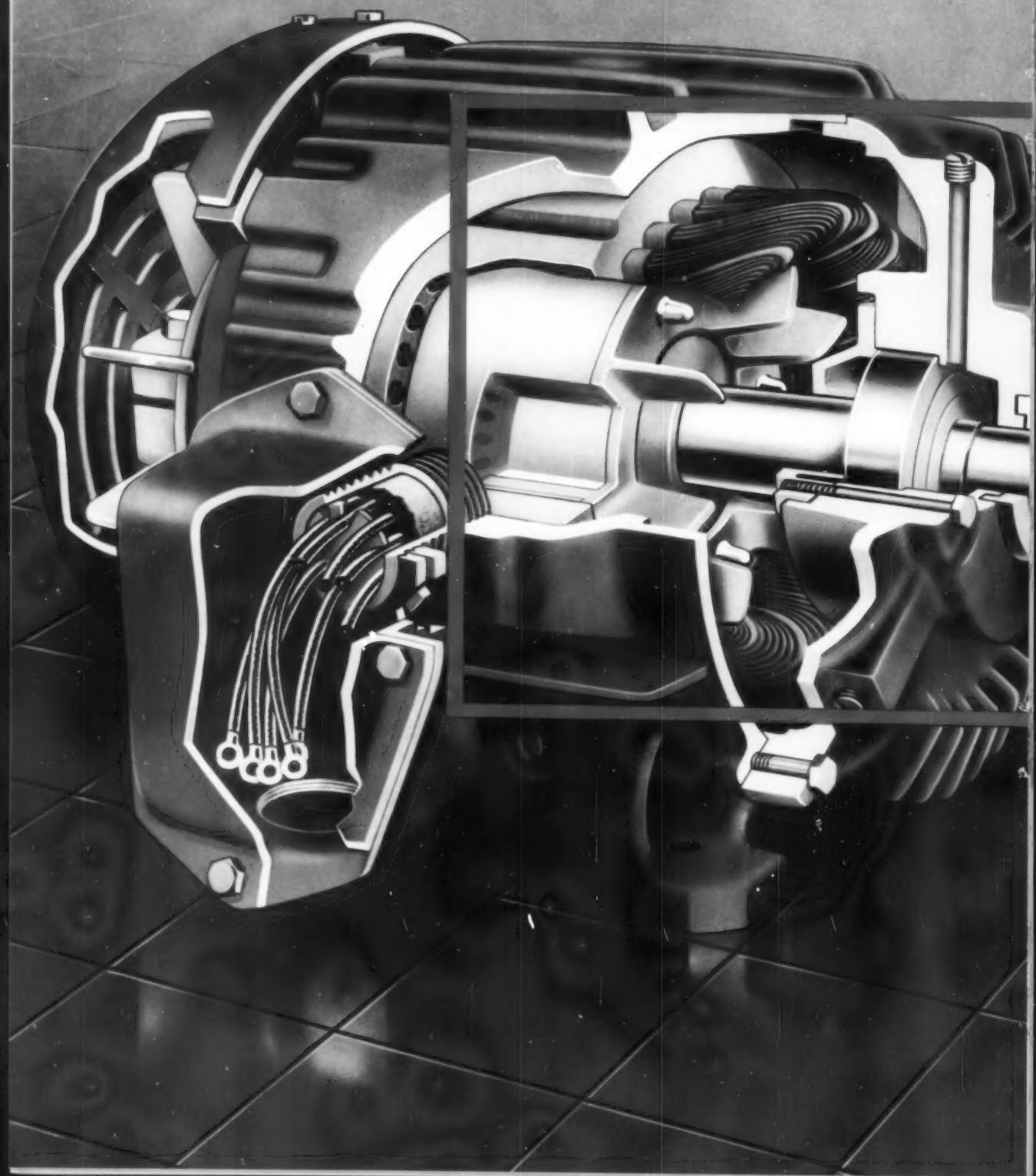
A-4386



ALLIS-CHALMERS



Get Greater with New Features



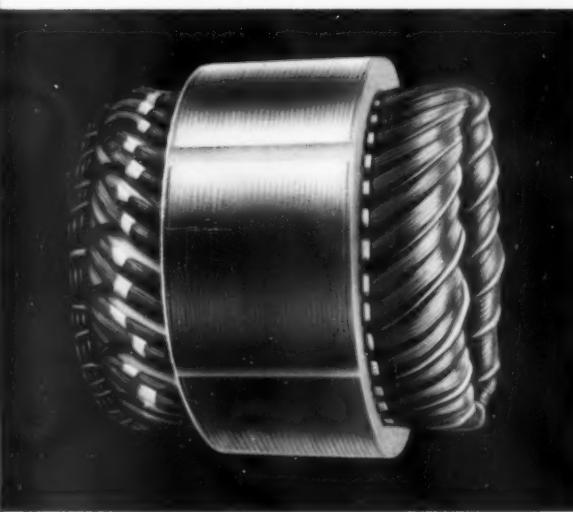
Motor Economy ... Proved Principles

Here's the inside story of a great new motor. It combines the best of the new developments in methods and materials with the best of the tried and proved principles that have made such an outstanding record for Allis-Chalmers motors.

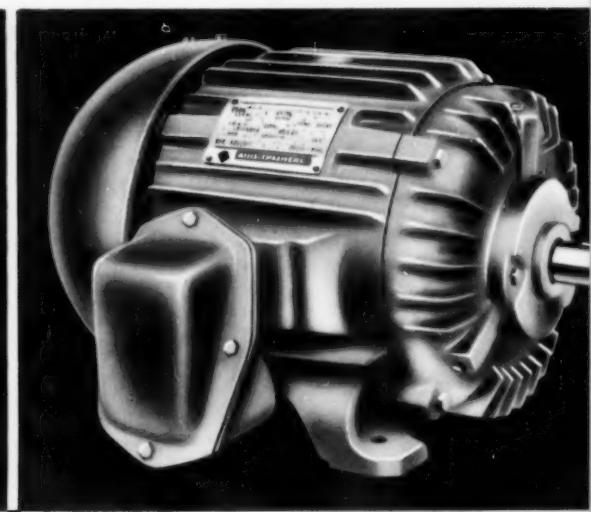
Smaller in size than previous design, it retains the easy-to-clean, fin-type construction which

Allis-Chalmers pioneered several years ago. The bearing design gives greater bearing protection, ease of maintenance and long life. Insulation gives you famous Allis-Chalmers rugged dependability.

Consult your nearby Allis-Chalmers Authorized Distributor or District Office on your motor needs. Or write for Bulletin 51B6210.



STATOR DOUBLE INSULATED —Stator laminations are welded across back for rigidity. Heavy varnished cambric insulation is inserted between phase windings. Wound stator is dipped several times in special insulating varnish of proved effectiveness and stamina, and baked after each dip. The Allis-Chalmers stator is both physically and electrically strong . . . thoroughly protected against moisture, heat and corrosion.



FIN-TYPE CAST-IRON FRAME — Proved by years of service. Cooling ribs are cast integrally with the yoke; air is blown over them without restriction. There are no enclosed external air passages to clog up with dirt and thereby ruin cooling efficiency. Radiating surface provides reserve cooling capacity for extra strenuous duty. Cleaning, if required, is a few moments work with an air hose, brush or vacuum cleaner.

Multiple bearing protection keeps grease in... keeps dirt out...permits relubrication in service

Extreme care has been taken to provide longest possible bearing life and lowest possible maintenance costs. The bearing itself is of double-shielded type, which allows controlled migration of grease in and out of the bearing to suit operating conditions. Yet bearing is protected against greatest cause of bearing trouble — overgreasing.

Close running clearances and double labyrinth seals be-

tween the shaft and outer bearing housings keep grease in the bearing and exclude dirt. Grease is kept out of the interior of the motor by a bearing cap with a long running clearance along the shaft. The cap is held tightly in place by hex head cap screws. Large grease chambers hold an ample supply of lubricant.

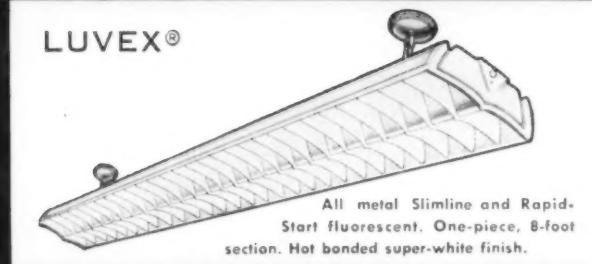
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LOOK AT DAY-BRITE



This is just a glimpse of the nation's leading line of lighting fixtures. Whatever the lighting job, there's a quality Day-Brite fixture to do it—not just as well, but better!

Best way to have the full picture of the Day-Brite line is to have an up-to-date catalog. If you don't already have one, write to the address below.

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478



NATIONALLY DISTRIBUTED, EXCLUSIVELY THROUGH LEADING ELECTRICAL WHOLESALERS

Washington Report

Electrical construction volume is headed for a new record in 1954, if Government forecasts on new building construction outlays and housing are realized. A joint estimate by Bureau of Labor Statistics and Dept. of Commerce made recently forecasts that total expenditures for new construction will hit \$36 billion this year. This is 2% above 1953's record level of \$35.3 billion, and \$2 billion higher than predicted for 1954 by these same agencies last November.

Private fund housing starts are now forecast at 1,080,000 for the year, were at annual rate of 1,100,000 for first four months of 1954. New commercial structure—office buildings, shopping centers, suburban stores—are expected to exceed \$2 billion for first time this year. Social and recreational buildings are projected for 32% increase over 1953.

Impact of new construction increases in types of buildings which require bigger take of total construction dollars for electrical construction work, plus growing electrical modernization market—rewiring for air conditioning, higher lighting intensities, etc.—will result in some 6% to 8% increase in electrical construction for 1954.

Watch for stepped up action on congressional bills during July. Senators and Congressmen, busy with hearings and studies on a GOP legislative program of more than 200 items for the past several months, are now anxious to get back home for fall politicking. Some 30-odd bills are considered major, are expected to be passed or rejected before adjournment. Watch for results on Public Housing Bill, revamped FHA terms, extension of Social Security benefits for broader coverage, extension of Hospital Construction Act, final military appropriations. Actions on these and other bills will affect your business in the months ahead.

Electric lamp production during first quarter this year was up 16% from 1953 similar period, at 605 million lamps. Shipments in first quarter were 517 million lamps, valued at \$74 million, or 2% ahead of last year. Inventories at end of March were 590 million lamps, 30% above stocks held a year earlier, according to recent Census Bureau report.

Income to individuals from all sources in April was at annual rate of \$282 billion, Commerce Dept. reported recently, down \$700 million only from year earlier but well above April 1952 annual rate of \$263.4 billion. One contributing factor was strike losses of only 1.2 million man-days due to Labor-Management disputes, lowest total since World War II.

Unemployment in May was reported at 3.3 million by Commerce and Labor Depts., or approximately 5% of all civilian workers. But employment still stood at a healthy 61.1 million, according to Census Bureau. Possible reports in early July of unemployment increases in June will reflect additions to labor force of graduating college and high school students, should be weighed in light of total employment figures for total impact on economy.

More lead and zinc is being stockpiled by the Government under a new long-term stockpile program designed to maintain adequate supplies for its needs in case of war which might cut off or destroy domestic sources of production. In the background this is also a price prop to aid the hard-pressed producers facing a highly fluctuating market. Office of Defense mobilization's new policy for fiscal year beginning July 1 will be spelled out soon.

Aluminum production in April totaled 120,400 tons, up 20,200 tons from April 1953, but 1,900 tons below record output of March of this year.

HOW ONE CONTRACTOR MODERNIZED SERVICE

BEFORE

Once upon a time some of this service in an apartment building was adequate for tenants' requirements . . . but ever-growing demands produced the atrocity shown here.

AFTER

And now see how the contractor, Summerall, of Memphis, cleaned up the mess with Stab-lok Circuit Breakers #108, motor socket troughs, and a Federal Safety Switch!

THE AMAZING FLEXIBILITY of Stab-lok® Circuit Breakers makes them an A-1 choice for modernization. In this particular example, space formerly occupied by Type D Safety Switches for 2 circuits is now occupied by Stab-lok #108's which accommodate up to 12 circuits. Now the building is assured of complete efficiency for meeting present demands, and of ready adaptability for future changes and expansion. In addition, Stab-lok provides the safest, most convenient

and modern circuit protection available today . . . at a cost comparable to fusible devices.

See your electrical wholesaler and have him demonstrate the many reasons why more Stab-loks are now being installed than all other circuit breakers combined. It will pay you to learn, too, about the unique advantages of Federal-Pacific's complete line of low and high voltage distribution equipment. Federal Electric Products Company, 50 Paris St., Newark 5, N. J.



FEDERAL & PACIFIC

ELECTRIC PRODUCTS COMPANY

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Federal products: Stab-lok Circuit Breakers, Motor Controls, Safety Switches, Service Equipment, Industrial Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct — **Pacific Electric products:** High voltage circuit breakers and power switches ★ Sales offices in principal cities.

JULY . . . at a Glance

HERMETIC MOTOR REPAIR—At the National Industrial Service Association meeting in Detroit last month the problems relating to the repair and rewinding of sealed air conditioning compressor motors aroused much discussion. The number of such motors now in use is running into the millions and eventually will present a service task of the first magnitude.

As a result of the geometric growth of unit air conditioning the vastly greater proportion of equipments in use today are new and in all probability, still good for years of untroubled service. But allowing for an appropriate service-free life it is obvious that a small fraction will eventually show up for repairs. And the numbers that do will tend to follow a geometric growth curve in the years ahead.

Difficult disassembly, stripping and reassembly, critical engineering requirements, and the need for special materials and the most rigorous cleanliness at every step in the repair process are discouraging factors. But they present a challenge to management and shop organization very much like the fractional horsepower repair business did some years ago. Then the problem was how to rewind profitably under the low ceilings imposed by the cost of new motors. The problem with hermetics will be much the same.

NEW HIGH VOLTAGE—The first American built 230 kv cable is being made by Okonite. It is the first commercial order for an underground cable of such high voltage rating to be placed with an American manufacturer. Potheads for the cable terminals were designed and built by the Ohio Brass Co. in conjunction with the development engineers of Okonite-Cal-lender.

The cable system is of the Oilastic type in which the cable is installed in an oil tight metal conduit. It is insulated with oil impregnated paper without a lead sheath but with armor for protection while it is pulled into the conduit. After installation the pipe is filled with oil under pressure, normally about 200 pounds per square inch.

The cable will be installed at the Cubatao Underground power plant in Sao Paulo, Brazil, where it will carry energy from the mountain cavern plant through a 1200-foot tunnel to the outside switchyard.

FOREIGN COMMENT—We usually think of "Do-it-yourself" activity as peculiarly American but our World News Bureau in Copenhagen, Denmark, tells us about an article in the Danish newspaper "Information" of June 12 devoted to the hazards, particularly electrical, of amateur handi-

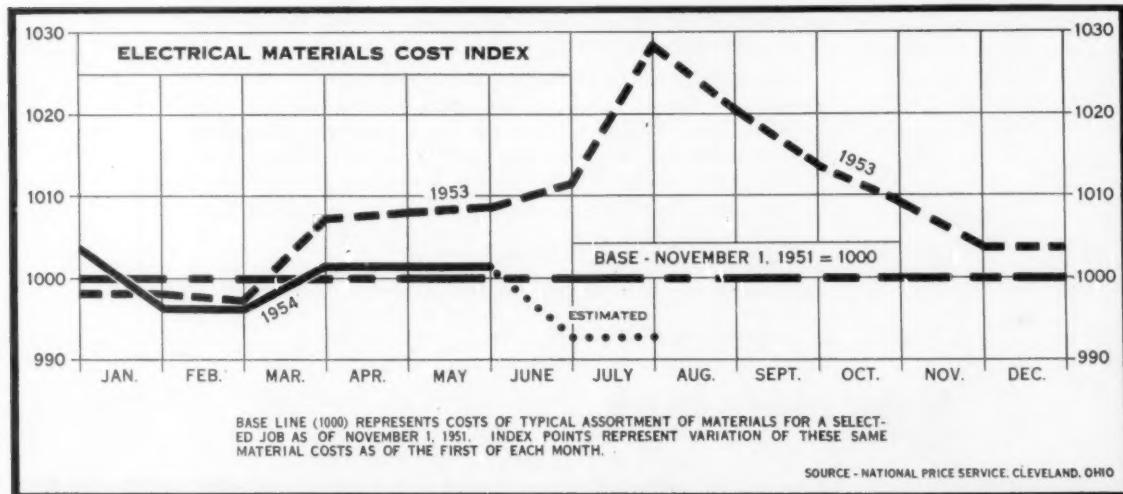
craft about the home. It quoted at some length from a translation of our editorial "Do-it-yourself Crisis" (page 61, April 1954, *Electrical Construction and Maintenance*) and concluded with a vigorous warning against the amateur's optimism in tackling jobs which require the services of experienced technicians.

ELECTRICAL LIVING AL FRESCO

—In a magazine devoted to homes we recently noted a beautifully illustrated article about outdoor living on the patio, the porch and in the garden. It showed a number of new and wondrous electrical appliances and gadgets to take the kitchen out of doors for electrical living al fresco.

Consumer magazine articles rarely mention the subject of watts or wire but it is apparent that a practical group of the appliances illustrated would take the capacity of at least two appliance circuits and two duplex weatherproof outlets. How many homes have that much electrical capacity available on the porch or patio?

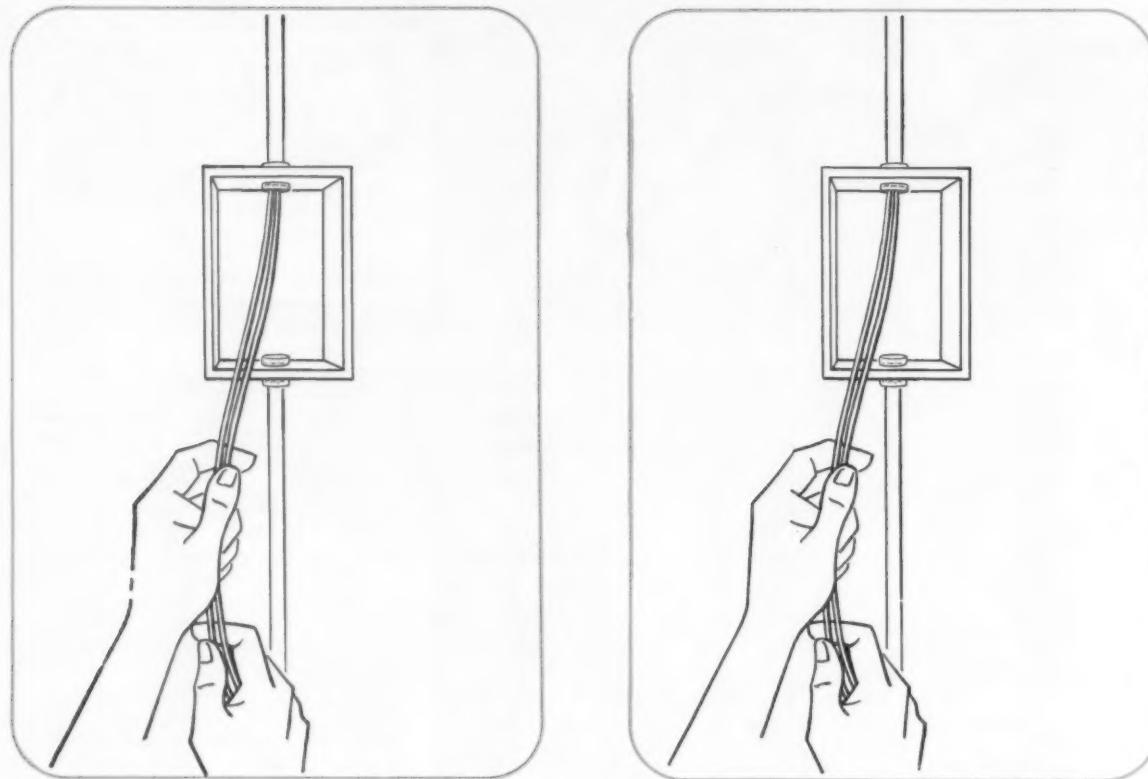
Such articles can be excellent sales ammunition for the electrical contractor. He can interpret these devices in terms of wiring capacity and take advantage of the glamour appeal of the new devices to help sell the prosaic electrical system so essential for their operation.



THE SAME WIRE?

IN LOOKS, YES.

IN PERFORMANCE, NO.



Feel the slicker finish on Anaconda TW — the easiest fishing wire today. It costs not a penny extra.

Most building wire may look alike . . . but there can be a whale of a difference in the way two wires handle.

Here's why we suggest you give ANACONDA Type TW a try:

It has a new "slipper" compound—applied just before packaging. It's smoother. You can fish this wire faster. You don't need pulling compounds. And no matter how long the wire has been around, the "slipper" doesn't lose its slickness. It won't harm insulation.

ANACONDA Type TW is the answer to many tough rewiring jobs. With its new slick finish, it fishes more easily through rusty, partially clogged conduits.

A sample will convince you. Ask your Anaconda Sales Office or distributor. *Anaconda Wire & Cable Company,
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ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JULY, 1954

ELECTRICAL CONSTRUCTION AND MAINTENANCE

53rd Year—JULY • 1954

Modernization Needs Selling

Public education on the need for adequate wiring has picked up a lot of momentum in recent months. It is encouraging to note the articles in consumer magazines and newspapers bearing on the subject. The capacity crisis in existing buildings is acute and immediate. And public understanding of the nature of the problem is sorely needed.

Collective and institutional efforts at mass education have their place and no doubt do a good job. But there are hard-boiled realities at the contract level that can destroy the effectiveness of all our efforts. And not the least of these are the evils inherent in traditional ways of buying electrical work.

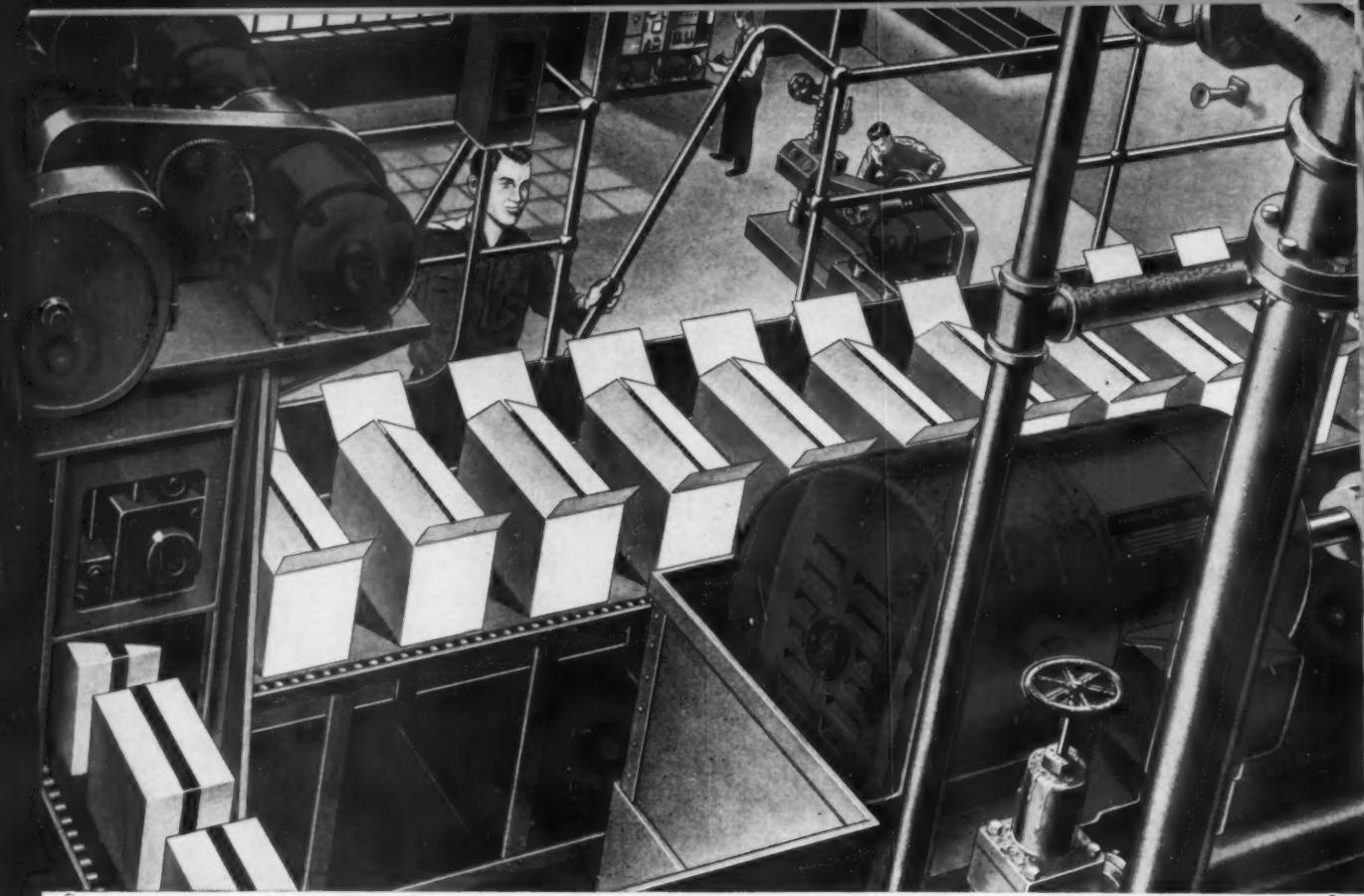
The decision to rewire and the scope and quality of the job often rests with people who have little interest in standards of electrical performance and who know nothing of electrical values. They, the owners, managers, real estate operators, trustees and such, may hire expert engineering help. But, if the situation is desperate, they may throw the job open for bids on inadequate plans and scanty specs, trusting in codes and competitive bidding to insure the prudence of their actions.

Provision for expected utilization is the very essence of electrical modernization design. Yet no code insists that electrical systems be designed to serve any future or expected load. And competitive bidding on informal specs necessarily selects the design with the least capacity. Consequently the widely accepted practice of buying on competitive bids, when applied to electrical modernization work, can produce, not the best, but the poorest value.

Strong individual sales promotion and personal selling is the only way to bring together the essentially constructive aspects of electrical modernization and best serve the public. Responsible selling by individual electrical contractors is a vital part of the public education process, transcending in importance anything that can be done by institutional or group activity. A reputable sales-engineering approach offers real value at a reasonable cost to the mutual benefit of the customer and the industry.

The wiring capacity crisis runs through the whole economy. A great many people with little or no experience in buying electrical systems need help and assurance of value in a technology largely beyond their comprehension. Each of these potential customers wants, not a thousand or ten electrical contractors to choose from, but just one who will seek him out, earn his confidence, advise responsibility and do the job properly at a fair price.

Wm. T. Stuart



POWER . . . WHERE POWER PAYS OFF. No matter how tough or how special the conditions, Graybar-distributed G-E motors

and controls give you full overload protection, guard against physical damage, electrical breakdown and operating wear.

How to cut down-time . . . step up production

SEND for your FREE copy!

Here in capsule form are the features of the new G-E Tri/Clad '55' motor — its new insulation system . . . new bearing system . . . new ventilating system. See for yourself how better performance and easier maintenance features will save your customers money year in . . . year out.



Here are two practical suggestions: *the first* gives your customers maximum defense against shutdown due to motor failure; *the second* insures reliable nonstop production shift-after-shift.

1. NEW, G-E TRI/CLAD '55' MOTOR — via Graybar. This all-new G-E Motor is built to last longer, perform better. New compact dripproof, rust-resistant cast-iron construction . . . new water shedding silicone stator windings . . . new stronger polyester film insulation . . . higher full load speeds . . . longer bearing life without regreasing.

2. GRAYBAR'S SPECIAL SERVICE ANALYSIS. Do your service conditions demand totally enclosed motors? Variable speed? Gear or reversible? A Graybar Power Apparatus Specialist will work with you in selecting the exact equipment for any machine-drive requirement. Call on him. It will pay off in longer, trouble-free performance. Remember, Graybar distributes the *complete* line of G-E motors and controls.

As a matter of fact, your local Graybar Representative can provide practical application data on more than 100,000 different electrical items. For wiring projects, for instance; or lighting, ventilation and communication; complete information is as near to you as your telephone. 437-47

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Electrical Modernization Ideas

Case studies from practical and current electrical modernization work in existing commercial, industrial and residential buildings.

Electrical modernization activity is going forward at a record pace. There is every indication of a growing market projecting far into the future. The pressure of electrical growth is creating new needs faster than they are being served with new electrical systems.

Electrical obsolescence often appears to spring up overnight when actually the conditions leading up to crisis have been accumulating through many years. Once a system is loaded to capacity it takes only a relatively small increment of new load to require urgent and immediate attention to the system design.

Electrical utilization growth can be charted for a large area or a community. The curve appears smooth and orderly. For a particular building, however, the growth appears as a series of steps, large and small, as specific loads are added. In one building, lighting improvement may be a long series of individual modernization jobs. In another the entire building may be relighted at one time. Air conditioning loads may appear gradually as individual room coolers are plugged in, or in one large block, when a central system is installed.

Whether load growth appears in small increments over a long period of time or large blocks at one time the ultimate requirements in system capacity are substantially the same. The design of electrical modernization must, therefore, encompass not only the present overload with a practical margin of future capacity, but must anticipate the nature of the load growth and its probable future course.

The statistics compel practical consideration of load growth as a real and important design factor. Industrial kilowatthour per production man hour went up 90% from 1943 through 1952. Average use per commercial customer went up 77% and average use per residential customer went up 120% in the same period. There are no indications that this rate of growth will change significantly downward in the foreseeable future.

In the following pages, the dimensions of the market, the opportunities and the problems are presented in practical case studies. These are the essentials and the details of actual current projects assembled from various parts of the country in recent weeks describing many different kinds of work. Most of the studies are written from the field notes of our own staff editors at the job site.

The examples selected do not necessarily represent advanced design or ideal methods. Rather they represent a realistic cross section of present activity and practice which may suggest to the reader similar opportunities in his own community.

COMMERCIAL

Electrical Modernization

Fourteen case studies of current electrical modernization work in commercial buildings are described on the following pages. The problems and opportunities of the field are exemplified in the wide variety and complexity of work encountered by our editors in seeking out typical projects for this study.

The reader will find few systematic patterns or principles prevailing through these jobs. No two are alike. Each presents its own unique problems and solutions. There is no effort here to offer exemplary standards nor to suggest the best possible solutions. This is current practice.





Bus Duct Risers for Lighting

... replace old multiple feeders at General Motors Office Building in Detroit. Larger transformers and shift to 3-phase, 4-wire system provide more capacity.

OUR new 2,000-ampere, bus duct risers fed by 3,000 kva of transformer capacity now serve the lighting requirements of the 34-year old, 15-story General Motors Building in Detroit. The new system was recently installed to break a bottleneck which gradually developed as lighting loads in the 2,200 offices and display areas increased to keep pace with modern standards.

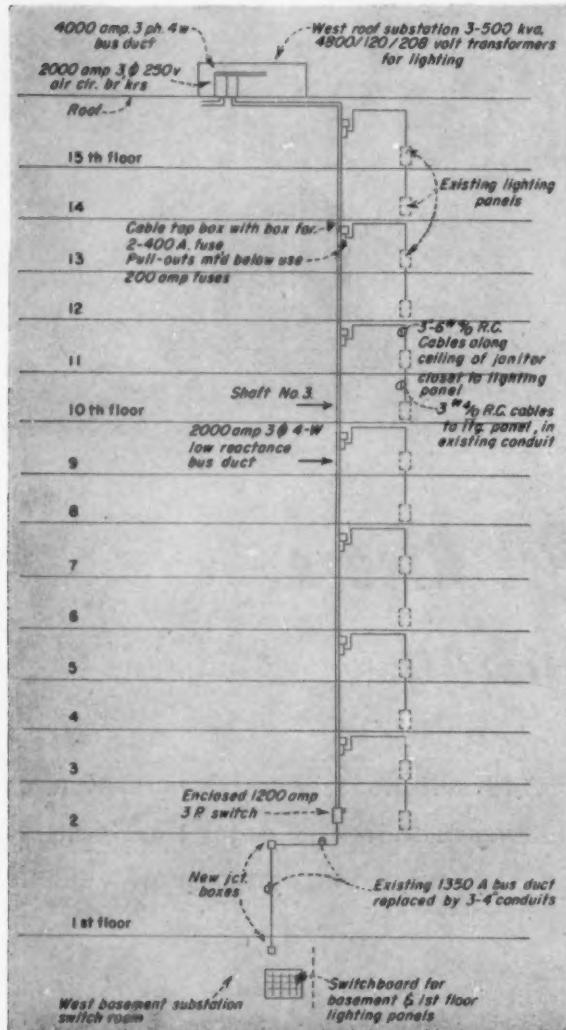
The old lighting distribution system originated in two basement substations, one each in the east and west sides of the building which consist of four north-south wings connected by a central office and elevator corridor. Originally, each substation had three single-phase, 150-kva, 4,800/115/230-volt transformers with single-phase, 3-wire secondary connections. As load requirements pyramided, additional units were added until one substation had eight 150-kva transformers and the other had seven. Space was at a

premium and ventilation problems increased.

Feeders to lighting panels at each floor were of the conventional multiple conduit and cable type—one 3-inch conduit with three 500MCM cables serving two panels on two floors. Panels in the east and west wings are located in stair wells on each floor; those in the central two wings are in janitor's closets adjacent to pipe shafts. Panel interiors were of the old fused, switched neutral type (jumpers added to make it solid neutral system). Meter fuse clips of 30-ampere size facilitated submetering of tenant requirements. Individual offices were served by two-wire branch circuits from the panels.

The New Feeder System

Now, all lighting capacity is concentrated in two roof substations (east and west) which also house unit substations for power. Each substation contains three single-phase, 500-kva,



RISER DIAGRAM of lighting distribution for typical wing of the office building. All lighting transformer capacity is concentrated in two roof substations which serve four 2,000-ampere bus duct "feeders."

4,800/120/208-volt lighting transformers with 3-phase, 4-wire secondary connections. Advantages of the new system include more room, better ventilation facilities and some 750-kva of space capacity. The basement substations now house part of the power transformer capacity.

Each roof substation serves two 2,000-ampere, 120/208-volt, 3-phase, 4-wire, low reactance bus duct feeders. The four ducts (one of them the ventilated type in a crowded pipe shaft) extend from roof to basement, each one serving one wing plus one-half of the connecting corridor. One riser is located in a tier of janitor's closets, another in a pipe shaft, two in stair wells at the east and west ends of the

building. All are as close as possible to existing lighting distribution panels.

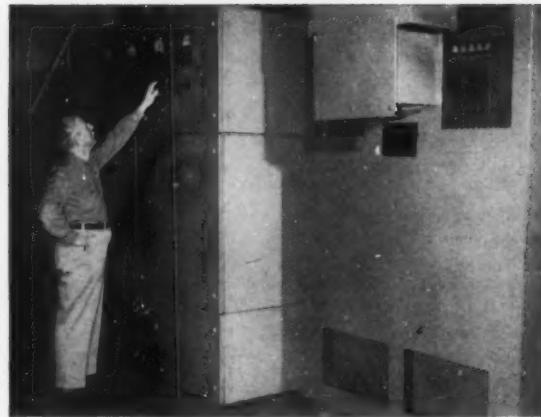
Fused tap-off boxes are mounted on the duct on alternate floors. Cable sub-feeders (two circuits of six cables) provide single-phase, 3-wire service to an adjacent panel and one on the floor below. Existing conduit connection between panels is used wherever possible. Panel loads are balanced on the 3-phase, 4-wire duct risers. Sturdy 1½-in. angle-iron "runners", installed from basement to roof, support the vertical bus duct risers, and right-angle brackets at each floor level help carry the combined weight.

Where risers occurred in stair wells, the marble slab trim was carefully removed before installation of run-

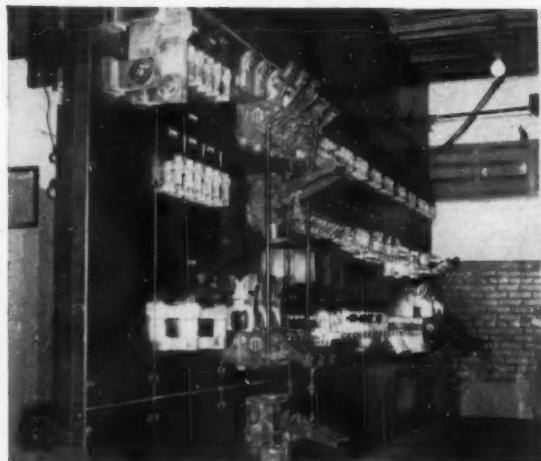
ners and duct sections. When replaced, these trim slabs effectively encased the lower portion of the duct run providing protection to duct and personnel using the stairs.

To reduce the shut-down time to a minimum, the electrical contractor on the project followed this installation sequence: transformers and associated switchgear, bus duct risers, conduit and cable ties to existing panel cabinets and finally panel connection. Temporary jumpers from the 2,000-ampere duct to the panels were used to provide service continuity during removal of old feeder cables and installation of new duct to panel connections.

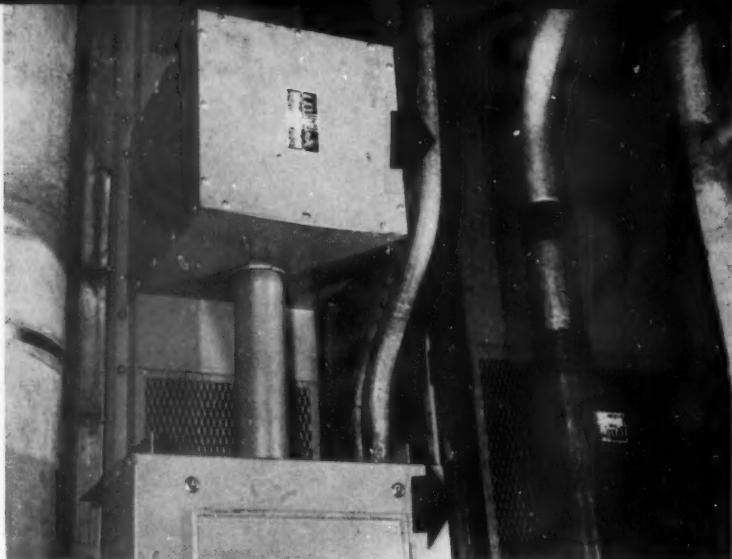
Final step in this modernization project was the replacement of the



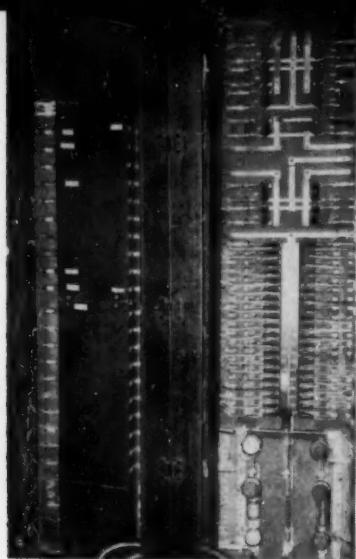
NEW LIGHTING TRANSFORMERS, one of which is shown with associated switchgear equipment, are located in two roof substations which also house power system components.



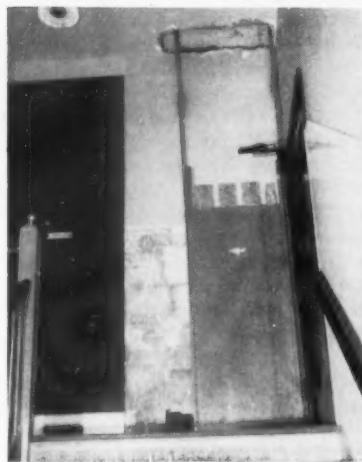
OLD LIGHTING SWITCHBOARD of live-front type in basement switchroom was discarded when new distribution system was completed. Room is retained for new power board associated with remodeled power system.



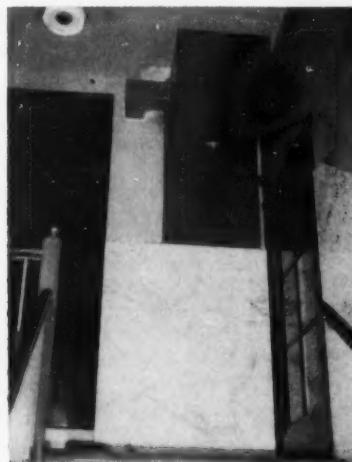
IN CROWDED PIPE SHAFT, new 2,000-ampere, ventilated bus duct (arrows) for lighting runs parallel to power duct at left. Conduit in front of duct runs to existing lighting panels.



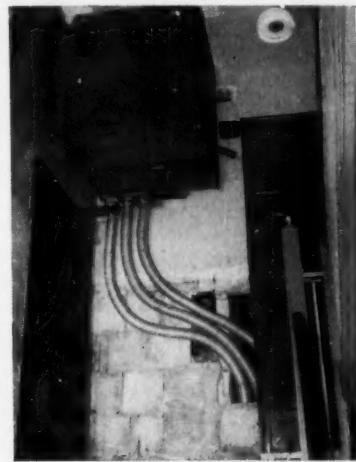
TYPICAL ORIGINAL LIGHTING PANELS like these were replaced with modern single-phase, 3-wire, solid-neutral units.



TO INSTALL DUCT RISERS in stair wells, marble trim slabs were first removed. Note angle-iron duct-support "runners" passing through ceiling.

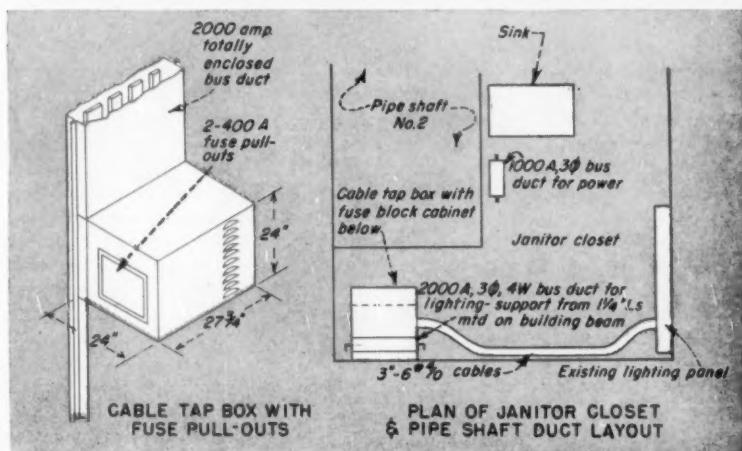


COMPLETED INSTALLATION in stair well showing protection provided by replaced marble trim slab. Cable trough from tap-off switch at ceiling feeds panel.

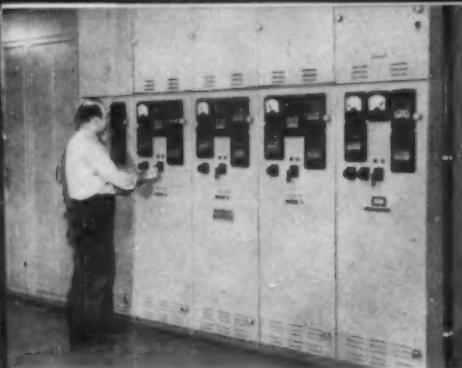


BOTTOM TERMINUS of a 2,000-ampere bus duct riser is this cabinet enclosing fused switch for panel at right and connections for cables going to basement.

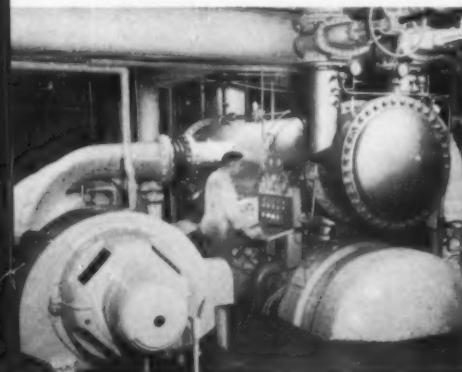
obsolete distribution panels with modern single-phase, 3-wire, solid-neutral units. Existing cabinets or "tubs" were retained and altered, where necessary, to accommodate the new panel interiors. Additional flexibility for tenant submetering was provided by equipping these panels with 30-, 60- and 100-ampere meter fuses. In general, the new panels contained a substantially larger number of branch circuits than the old units. This eliminated a number of existing make-shift arrangements and provided a measure of spare panel capacity for future expansion. Branch circuits to individual offices remained intact and were connected to the new panels as the units were installed.



DETAILS OF DUCT connection to existing lighting panels in janitor closet and pipe shaft areas. Fused tap-off serves two sub-feeders—one for panel in room, other for panel on floor below.



CONTROL PANEL for three 500-kw rectifiers regulates dc service to many motors which were retained in an otherwise store-wide ac changeover. Small dc loads are served through separate rectifiers.



SPACE CONSERVATION is indicated by this 800-ton ac air conditioning unit that now occupies the space formerly crowded by a 320-ton dc compressor. Power conversion also permitted full exploitation of fluorescent lighting, greater system flexibility, reduction of maintenance and billing economies.

Rectifiers Serve DC Motors in AC Conversion

MODERNIZATION of the Higbee Company's department store in Cleveland, Ohio, involved a major changeover from direct to alternating current and the substitution of fluorescent for incandescent luminaires in many sections of their shopping center. This made it possible to double their illumination levels without adding to the total lighting load or light-circuit wiring. The conversion also permitted tripling of air conditioning capacity to 2800 tons. Simultaneously, Higbee added extra power feeds, control centers and outlets for special lighting effects and other local services. In this store-wide program, however, one of the important decisions involved the disposition of considerable dc equipment which would be prohibitively costly to convert: equipment such as the motors driving 20 passenger elevators, 4 freight cars and a service lift, also 20 escalators, 20 large ventilating fans, numerous pumps and many incidental office machines, some of which could not be replaced at the time due to shortages or obsolescence. In all, this block of critical dc equipment exceeded 1500 horsepower.

The answer to this keystone problem was supplied by using rectifiers, thereby reconverting the newly-ac-

quired ac primary service back to dc for the operation of these items. To serve the heavy and centrally grouped pieces of equipment, three hefty 500-kw G. E. rectifiers were installed in one bank, while smaller rectifiers between 1 and 5 kw in capacity were wall-mounted closely adjacent to dc distribution panels or to the office or restaurant equipment which they served. This method of location greatly minimized lengths of branch connections. Those instances where ac and dc is controlled from the same panels find wiring so arranged that ac switches are placed at the tops of boards and dc switches are located beneath them, with horizontal baffle plates segregating the two types of service wiring within the panel enclosures themselves.

This installation, made by Hatfield Electric Company, now permits Higbee's to enjoy the advantages and economies of purchasing primary ac from the Illuminating Company, retain the use of their costly or hard-to-replace dc prime movers, use their electrical distribution to better advantage, exploit the full possibilities of fluorescent lighting, cut down on routine electrical maintenance, and save valuable service space through the use of more compact equipment.

Office Building Outgrows 1941 Service

IMPROVEMENTS in lighting, plus the addition of unit air conditioners in the Sante Fe building in Los Angeles made obsolete and inadequate the new electric service installed in 1941. The old lighting system in use in 1941 was incandescent, which has been replaced by fluorescent lighting.

The new fluorescent system provides more illumination on an equal wattage basis, but lighting intensities have been upped about four times that of the old incandescent system, thereby doubling the load demand. A total of 90 unit air conditioners have been installed this year, all of which added new load not planned for in 1941.

A basement fire in 1940 burned out the old electrical service. A new service, consisting of one 3-phase and two

single-phase mains, were installed in 1941. This new service was considered adequate to serve electrical utilization equipment (lighting, elevators, motors, etc.) in use and contemplated at that time.

To meet the impact of load requirements for new lighting standards and air conditioning, plans were drawn up in 1953 for added service capacity. The existing service was retained, and a new service added to implement the old system.

The new service consists of one new 3-phase main and one new single-phase main. These two new mains run to the old switchboard, where the new single-phase main, phase C, feeds six new lighting feeders through breakers installed in one of the spare panels

of the old board. The new 3-phase mains continue through conduit to the new main switchboard, through a 600-amp 3-phase disconnect, thence to 10 power feeder breakers.

Both power and lighting sub-feeders have been redistributed on the old and new switchboards to equalize loads. New feeders were installed to serve the air conditioning units, of which 86 are window type units of 1- and 1.5-ton capacity. Some use 220-volt motors and some 110-volt motors. Four other units are larger types: one is 7.5 tons, one is 5 tons, and two are 3 tons, all fed by 3-phase 220-volt service.

This new electrical service and necessary subfeeders, panels, etc. was installed by Hill Electric Company, of Los Angeles.



LUMINOUS GLOBES formerly provided insufficient illumination, created glare spots and introduced an element of distraction without revealing the true beauty and impressiveness of the rich woodwork and fine panel workmanship.



PANELING of ceiling and walls is enhanced by installation of recessed Annulites and attractive wall urns that combine to provide 25-30 footcandles to desks in this Superior Court Room.

New Light for Justice

MODERNIZING the lighting in the Superior Court Room of the Cumberland County Court House, Portland, Maine, consisted essentially of substituting recessed down-lights for old, ornate, luminous-globe fixtures, plus the addition of several cleanly-designed, flared wall urns to direct light upwards. This treatment was not drastic, yet it accomplished far more than merely increase footcandle levels. In fact, the room which formerly was depressingly gloomy is now impressively sedate, the atmospheric transition due largely to the relighting and

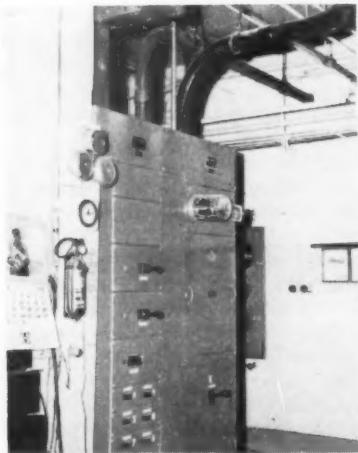
the resultant rediscovery and reappreciation of intricate ceiling panelling, rich oak wall woodwork and fine carvings on the furniture.

By installing 300-watt Rambusch Annulites in the centers of 25 ceiling coffers, illumination levels delivered to the judge's desk and to the center of the room became 25 and 30 footcandles respectively—values more than twice those formerly existing with the older installation. By finishing the ceiling rings around the Annulites in a simulated oak, these fixtures were blended harmoniously with the original

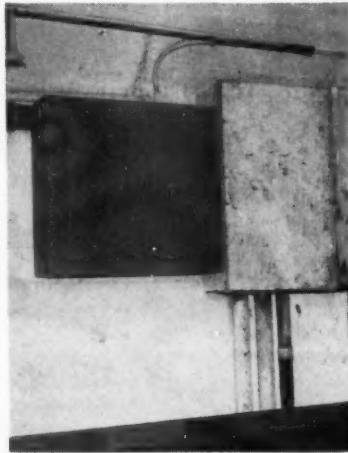
motif of the panels, minimizing eye distraction and eliminating glare associated with the former luminaires.

To further enhance the beauty of the ceiling, the eight wall urns (Rambusch TF360) were spaced along the side walls, between windows or flanking the main doorway.

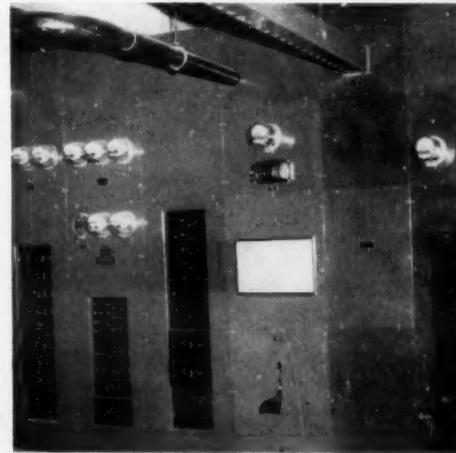
New fixtures, controls and circuits were installed by electrical contractor Edward S. Boulos in accordance with the lighting plan jointly prepared by architect Lester I. Beal and Illuminating Engineer Perley E. Weatherbee of the Central Maine Power Company.



NEW SWITCHBOARD installed in 1954 is used for power loads, served by 600-amp 3-phase 220-v main switch, lower right panel. Power feeders to panels throughout building were divided between the two switchboards to equalize load on the two 3-phase mains.



OLD SERVICE for Santa Fe building, Los Angeles, consisted of one 3-phase 220-v and two single-phase 110-v services (right), which was implemented by new 3-phase 220-v and one single-phase 110-v service (left). New cables run through old cabinet into new splice box.

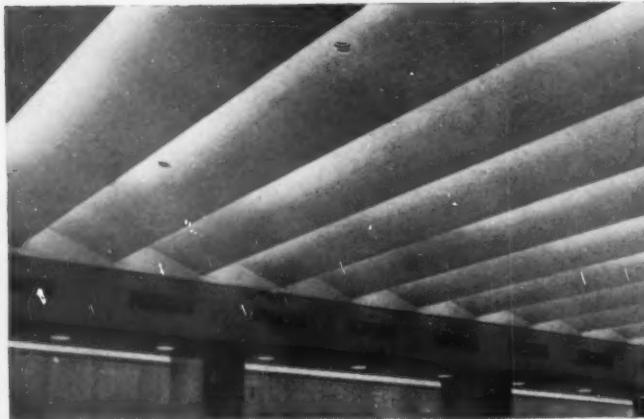


OLD SWITCHBOARD installed in 1941 was retained, and new phase "C" for lighting and other 110-v service was installed in spare panel at right. Wireway, at top of photo, carries redistributed circuits over to the new three-phase switchboard.



MODERN LIGHTING in acoustical ceiling of second floor reception area includes: four-lamp, 96-in. T-12, Alba-lite shielded troffers (foreground); square coffered (middle of area), each lighted by four concealed 36-in. T-8 fluorescent lamps; and 200-watt, recessed, incandescent lens boxes (in background). This area was created when floor slab was built across high-bay lobby; new lobby is directly below.

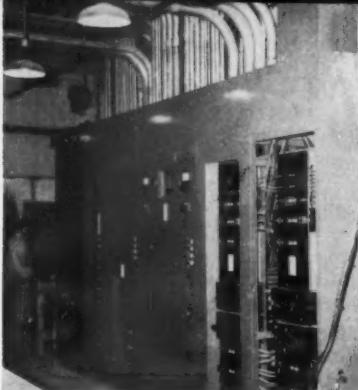
New Electrical System Serves Dallas Bank



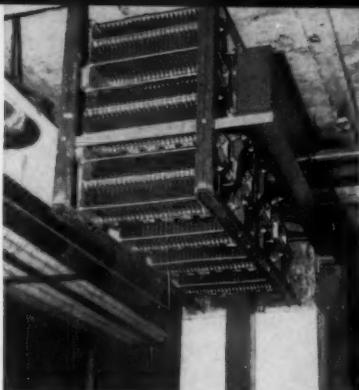
LOBBY CEILING in 200-foot long main banking area is constructed as shown on bottom side of new slab which was built across previously high-bay area at level of old balcony around lobby. Saw-tooth ceiling panels conceal continuous row slimline lamps.

EXTENSIVE electrical remodeling—from the main switchboard out to far flung plug outlets—was part of the complete renovation of the First National Bank in Dallas, Texas. Here, under the direction of J. R. Williams, Chief Engineer for Harman Electrical Construction Co., Dallas, modern installation methods and on-the-job engineering were combined to provide a new, high capacity electrical system throughout the group of connected buildings which make up the bank. Details of the job in the main bank building are shown in accompanying pictures.

The main bank building was built in 1918. Originally, it had two separate services—one 120/240-volt, single-phase, 800-amp service and one 240-volt, 3-phase, 400-amp service for pumps and elevators. A third service was installed in 1946—208-volt, 3-phase, 2000-amp service for air con-



NEW SWITCHBOARD located in basement, up against wall adjoining utility vault, is fed at 120/208 volts, 3-phase, 4-wire with grounded neutral. Enclosure houses main power breaker, main lighting breaker and feeder CBs.



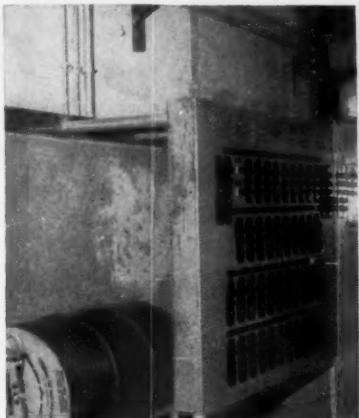
GRID RESISTORS for new compressor motor are mounted on channel iron frame against the ceiling and on upper part of column. Channel iron is bolted to concrete. Resistor leads are carried in wireway mounted against resistor bank.



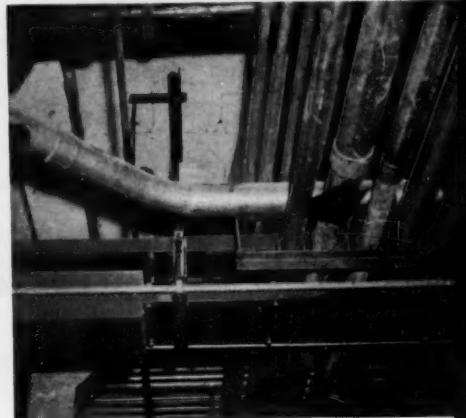
PULL BOXES of various sizes and shapes (large one shown) were used extensively to eliminate offsets in large banks of conduit. Heavy concentration of water pipes, other existing conduit and structural elements complicated installation.



SPECIAL WIREWAYS (arrow) were custom made for many applications on this job. Here, sheet steel enclosure carries conductors from starter for 450-hp compressor to motor terminals in large ventilated box at lower right.



AIR CONDITIONING pushbutton panel is mounted on angle iron base alongside compressor cubicle in basement. At rear of panel, conduit connects panel to wall mounted wireway. Panel provides control of all remote air conditioning motors.



CONDUIT AND BUSWAY suspension required on-the-job fabrication of wide range of sizes and types of angle iron trapeze hangers. U bolts were used to hold individual conduit runs to angle hanger (arrow).

ditioning. All services were made from a single utility transformer vault under the sidewalk at the building line. Up to the time of the recent modernization, various rewiring jobs had been done in the building to increase lighting levels and provide for appliances and business machines. All of the work done over many years, however, was relatively uncoordinated and of only a temporary nature in the long run.

Recent modernization of the electrical system provided an integrated, adequate system of distribution and utilization wiring, with spare capacity for load growth. The job entailed extensive cutting and patching; however in many places where plaster and lathe were torn out to relocate partitions and make other structural changes, rewiring was relatively simple. Use of hung ceiling facilitated many problems associated with conduit runs. Conduit was concealed in

the space above the acoustical ceiling tiles. Surface raceway was widely used, and in many places concrete floor slabs were channeled to accommodate flush floor raceways for utilization and signal circuits. Widespread application was made of lighting units recessed in the hung ceilings—fluorescent troffers, luminous and louvered large area panels, fluorescent coffers and recessed incandescent boxes.

Rearrangement of service to the building was the basis for the complete job. Of the three old services, only the 1946, 3-phase, 2000-amp busway-feed to an existing 450-hp air conditioning compressor was retained. A new, 3-phase, 600-amp busway run feeds a new 200-hp compressor. The new main service is a 6000-amp, 3-phase, 4-wire (grounded neutral) busway to a new main switchboard. All of these feeds from the utility vault outside the basement wall are 120/208 volts

wye. The old switchboard was removed, and all conduit to it was rerouted to the new switchboard which is up against the wall through which busway comes from the vault. From this new switchboard, new and existing conduits carry feeders to light and power panels throughout the group of buildings.

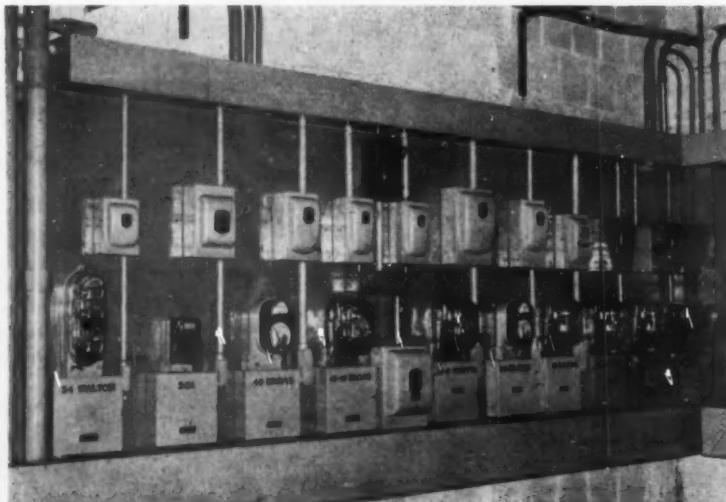
A large portion of the new second floor in the bank was created by closing over the light well that formed the high-bay main lobby before remodeling. A floor slab was laid across the well at the level of what previously was a balcony around the lobby. Electrical work in this new section was, for the most part, new construction.

In addition to installation of scientific lighting and robust branch circuits, the electrical job included installation of conduit systems for telephone, A.D.T. signal and music reproduction wiring.



ADEQUATE POWER for modern electrical needs of tenants in Atlanta's Grant Building is assured by this new main switchgear equipment supplying 208/120-v ac service replacing the former 1200-amp dc service.

Improvements Increase Tenant Electrical Capacity

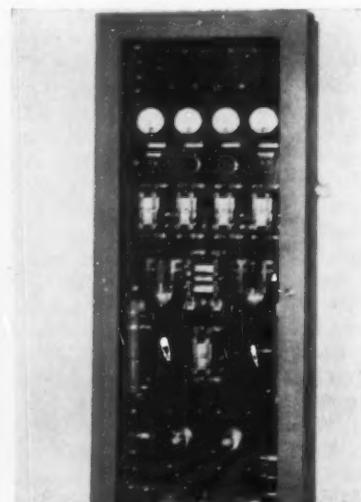


POWER is metered separately for each tenant. Meters are installed on two walls of basement electrical room. Feeders enter metal raceway at bottom of panel through large conduit (left), extend up through switches to metal raceway at top.

COOL, air conditioned offices and stores, improved lighting, and smaller light bills have been made possible for tenants in Atlanta's Grant Building. These benefits all result from a changeover in electrical service to the building from dc to ac, and from installation of a much larger modern electrical service and electrical distribution system with adequate power capacity to meet today's modern electrical demands.

The Grant Building is strictly a tenant property. The first floor is occupied by several stores and a large public elevator lobby, while all upper floors are used as offices. The basement contains all mechanical and electrical facilities and storage area. The Building's 1954 modernization program included installation of air conditioning equipment, fluorescent lighting, a modern electrical system throughout, and the painting of many of the areas. This work not only has improved the appearance of the building, but also has made it a pleasant place to work and shop. These improvements have put this old building property on a par with new office buildings in Atlanta, and it is now fully occupied.

The original electrical service in this building, was a 1200-amp 110-volt dc service, which was in use until the present changeover. It had been supplemented by an 800-amp ac service installed a few years ago to meet the growing needs of certain tenants, and for lighting improvements with fluorescent lamps. The direct current power was supplied at a premium rate, as has been the practice in other cities where local utility companies have



CONTROL PANEL for IBM fire alarm system is located in superintendent's office.

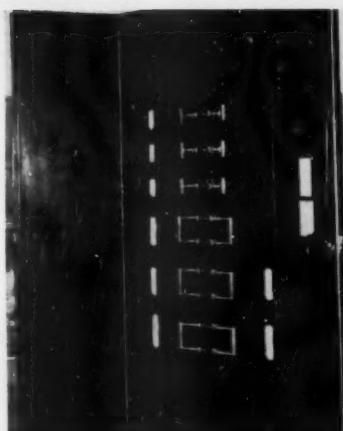
made every effort to convert customers over to the less costly and more flexible ac service. As a result, the average bill for lighting in this building has dropped approximately \$100 per month since the switch to ac, according to building superintendent J. P. Bomar.

The current peak load for the entire building is approximately 272 kw demand. Load increases have been due principally to two factors: air conditioning, and the switch from incandescent to fluorescent lighting with intensities averaging from four to five times the previous intensities.

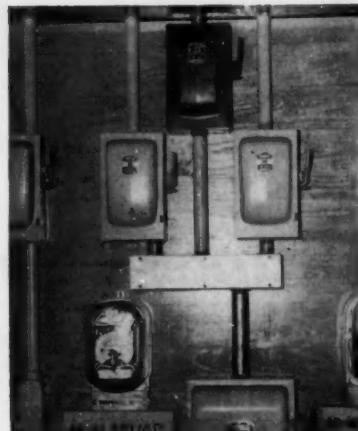
The newly renovated electrical system consists of new main switchgear equipment, tenant meters and main switches for feeders to each tenant property, main distribution panels with pull-out type circuit breaker protection for branch feeders, branch circuit panels, and emergency power system, fire alarm system, and fluorescent lighting.

Power is supplied to the building over a 208/120-volt 3-phase 4-wire system. This service comes into a 4000-amp main circuit breaker type switch where it is redistributed through three 800-amp and two 600-amp circuit breakers switches. From the main switchgear units feeders extend to a tenant meter panel covering two walls of the electrical room in the basement, thence through main switches on individual branch feeders to main distribution panels. Branch feeders in turn supply branch circuit panels, which distribute the power to ultimate utilization devices.

Air conditioning in the building is accomplished by individual units of the console and window type. All air



MAIN DISTRIBUTION panel for 12 branch feeders in one end of building is typical. Feeders are run to and from panel in conduit.



METERING for store tenant having three branch feeders is shown with three branch switches and one common main feeder switch.

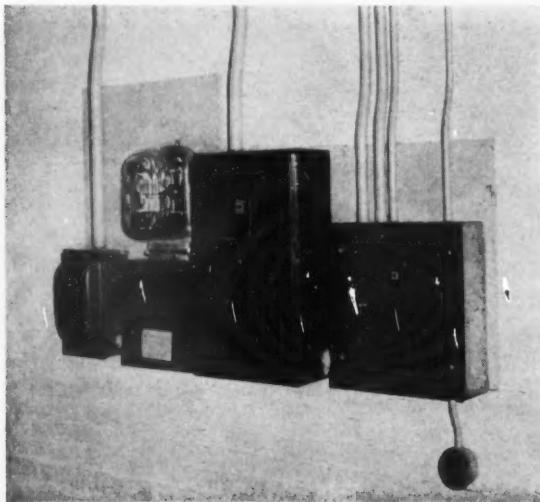
conditioning units are connected to separate electrical circuits installed for this use.

The emergency power system consists of a 60-amp switch, separate meter, and fuse panel box emergency power and lighting circuits. It is connected to the power company service ahead of the 4000-amp main circuit breaker. Emergency circuits include two hall lights and two exit lights on each floor, all stairway lights, and several key lighting units in the basement.

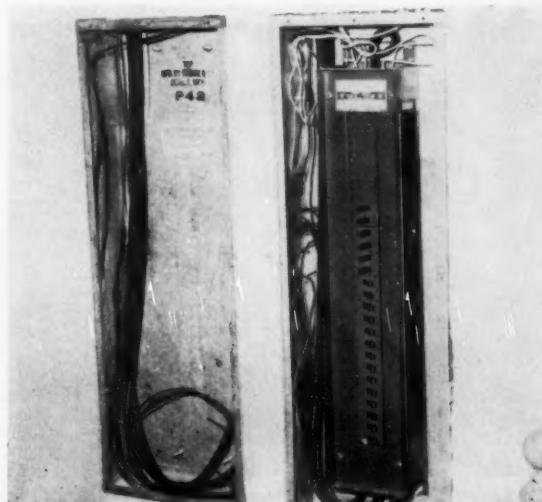
An IBM fire alarm system includes a control panel in the superintendent's office and fire alarm boxes distributed throughout the building. The system is so arranged that when a tenant turns on an alarm, it registers on the

main control panel only. This permits a quick investigation by an attendant, who then turns on a final alarm to the fire department with a special key, if the size of the fire warrants. This procedure is followed to prevent panic which might arise over small waste-paper basket and other similar fires.

Fulton Bros. Electric Co. of Atlanta has made the complete de-ac change-over and installed all the new equipment. This is only one of several such electrical modernization jobs handled by this progressive electrical contracting firm in recent months. Charlie Fulton, professional engineer and junior member of the firm, estimates that in 1953 about 70% of their electrical construction work was in the field of electrical modernization.



EMERGENCY POWER is controlled by 60-amp switch, metered, and fed to emergency branch circuits ahead of 4000-amp main circuit breaker.



BRANCH CIRCUIT panels on 6th floor are typical. Panel on left shows lighting panel before circuit breakers were installed. Panel at right is for unit air conditioners.

Electrical Changes for Store-Office Conversion



EXISTING ELECTRICAL CLOSETS on stair landings house new 40-circuit panels and new feeder conduits.

COMFORTABLE, evenly-distributed, glare-free lighting is an outstanding feature of the recent conversion of a 40-year-old, three-story department store building into general offices for Wieboldt Stores, Inc., at Evanston, Illinois. Approximately 40,000 square feet of luminous plastic ceiling supplied by Luminous Ceiling, Inc., Chicago, were used to provide a maintained illumination intensity of 50 to 60 footcandles on the three floors. The lighting system and complete rewiring from existing switchboard to existing ceiling outlets were installed by Hultgren Electric Co., Chicago, and Wieboldt electrical personnel under the supervision of John Skanderup, Wieboldt construction engineer for the project.

Biggest problem Wieboldt's faced when they decided to occupy the Evanston structure was the transformation of the high-ceiling areas into a modern office interior. Installation of a conventional suspended ceiling, with plaster or ceiling board finish, would have been costly and would have involved reversing existing sprinkler system heads and extending them to new ceiling height. Also, a suitable lighting system to blend with the new interior design would have to be added.

Management solved this multiple-facet problem by selecting a luminous ceiling installation. They now have an easy-to-maintain lighting system that provides the desired illumination intensity and a ceiling which complements the interior decor. Also, the



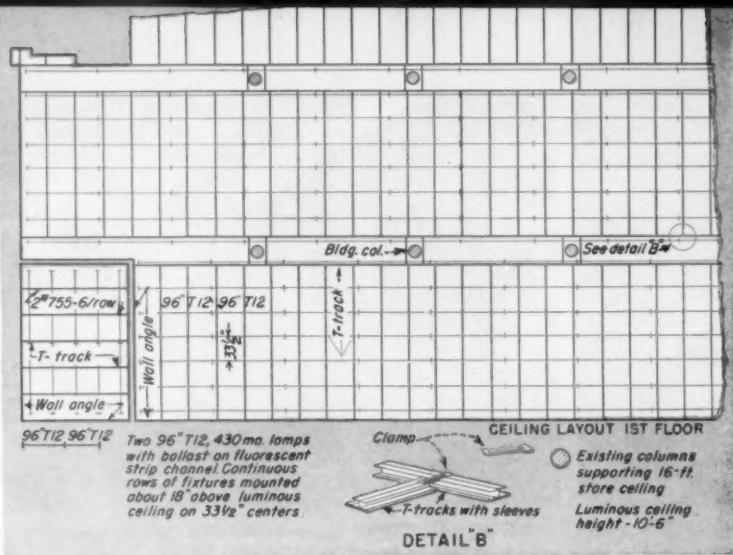
SUSPENDED STEEL GRID of T-Track supports 36-in. wide strips of corrugated plastic diffuser 18 inches below continuous rows of 96-in. T-12 white fluorescent lamps mounted on 33-inch centers. Original sprinkler system remains intact.



MAIN FLOOR AREA is covered wall-to-wall by luminous plastic ceiling 10 ft., 6 in. above floor, which provides a maintained intensity of 50 to 60 footcandles.



EXISTING CEILING OUTLETS are used to feed new lighting system with new branch circuit wires in existing conduits back to lighting panels. Steel grid is supported from fluorescent channel.



PARTIAL PLAN of first floor area showing details of wall-to-wall luminous ceiling grid. Long, sectionalized horizontal lines indicate continuous rows of fluorescent strip above the grid.

original sprinkler system remains intact, since the plastic ceiling panels will soften and drop at a temperature lower than that required to set off the sprinkler heads.

In general, lighting on the three floors is provided by continuous rows of fluorescent strip (using 96-in., T-12, 430 ma lamps) mounted on 33½-inch centers. In the 16-foot-high main floor area, the fixtures are rod-suspended at 5-ft. intervals so the lamps are approximately 18 inches above the 10½-ft plastic ceiling. Fixtures on other floors are either suspended or ceiling-mounted depending upon original ceiling heights. The luminous ceiling on the 12-ft second floor is mounted at 10 feet. On the third floor it is installed at 8½-ft and 10½-ft (10-ft and 14-ft

original ceiling heights) with a vertical curtain wall of corrugated plastic at the elevation change.

In all cases, electricians suspended the supporting grid of T-tracks from the fixture channel as the second step in the ceiling installation. The final step, after lamping, was the addition of the plastic strips to the grid. The corrugated plastic was delivered to the project in 36-in. wide rolls, cut to length and clearly identified according to the ceiling grid plan. A two-man team installed the strips, one mechanic unrolling the plastic while the second mechanic guided the strip into and along the T-tracks of the ceiling grid.

Continuous rows of 4-lamp fluorescent fixtures of 9½-ft centers illuminate the low ceiling basement area.

Complete rehabilitation of the existing electrical system was necessary to serve the new lighting installation. Old distribution panels consisting of porcelain plug fuse blocks with rotary switches were removed, but the panel "tubs" were retained for access to existing conduits and for use as wiring troughs. New 40-circuit, 3-phase, 4-wire, solid-neutral, 120/208-volt, switch-fuse panels were installed on each floor, generally in existing electric closets on stair landings. Panel cabinets mounted to the existing "tubs" were ordered with full-length open back to match trough width and provide wiring access to concealed branch circuit conduits. New feeders (four No. 4/0 cables in 3-in. circuits) were installed from the existing main switchboard in the basement to the new distribution panels. Existing conduits were used wherever possible.

New branch circuit wiring was installed in existing concealed conduit throughout the area. Type TW No. 12 conductors go from the new panels to ceiling outlets, then through conduit extensions to the continuous fluorescent channel. In general, each circuit serves a total of 12 fluorescent lamps. Convenience outlets, as well as telephone outlets, at desk locations are surface mounted on the floor and served by conductors in surface-type, metal floor molding.

Electrical modernization in this converted department store provides a modern lighting system that not only enhances the building interior, but contributes substantially to the working morale and operating efficiency of the 400 office employees.



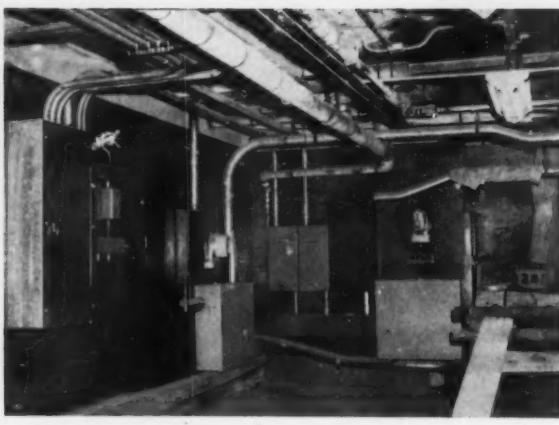
PLASTIC DIFFUSER material comes in rolls cut to specified lengths; is fed and pulled in guide tracks on supporting steel grid. Electricians wear white gloves to keep plastic clean during installation.



LOW CEILING BASEMENT area is illuminated by continuous rows of surface mounted fixtures. Bottom diffusing panel is corrugated plastic. Side panels (not yet installed) are also plastic. Four-lamp fixtures are on 9½-ft. centers.



NEW BANKING AREA in Hudson County National Bank, Jersey City, N. J., was formerly a cafeteria with beam ceilings. Suspended acoustical ceiling and recessed lighting converted confused structural interior into attractive area with cheerful atmosphere, and pleasant place to do business.



ADDITIONAL POWER necessary for new lighting and air conditioning was installed in basement. New equipment used includes power panel and motor controls (left) and two new circuit breaker switches, one for power and one for lighting (center). Electric power is on 120/208-volt 3-phase 4-wire system.

Industry Cooperation Aids . . .

Electrical Modernization in a Bank

WHEN the Hudson County National Bank in Jersey City, N. J., outgrew its facilities last year, it decided to take over an adjoining space in the same building formerly occupied by a cafeteria. How this was accomplished and how the bank obtained a good lighting system through electrical modernization in this former cafeteria area is a significant story of cooperation between the bank, the electrical contractor, the electrical wholesaler, the local public utility company and the general contractor.

Bank officials first contacted the local electric utility and asked for lighting recommendations when the area was still a cafeteria and the proposed bank addition was in the planning stage.

The old cafeteria had an 11-foot high ceiling cluttered up by a mixture of beams of varying sizes, so located that no two bay areas formed by the beams were of the same size. The problem of designing a symmetrical lighting plan was further complicated by ducts required for a proposed air conditioning system. Lowering the ceiling to the bottom of the deepest beam would result in a ceiling height of only nine feet, to which the bank president objected.

Taking all these limitations and restrictions into account, lighting engineers for Public Service Electric & Gas Company, the local utility, proceeded to lay out a lighting system. They recommended surface mounted

fluorescent luminaires 2 ft. by 4 ft. in size, equipped with Plexiglas diffusing covers. Over the tellers' area 4-lamp units were recommended, while over the desk area and other spaces 2-lamp units were recommended. These units were spaced in the best pattern possible, considering the beam layout and air duct runs, and would have provided a satisfactory lighting job. But the bank president was not satisfied—this was not quite the job he wanted.

Contractor Takes Over

In the meantime the bank had called in electrical contractor John C. Morris, Jersey City, to discuss the electrical work involved. Inasmuch as the lighting layout would affect the wiring, electrical contractor Morris asked Graybar Electric Company's lighting department, as his electrical wholesale supplier, for lighting recommendations. Graybar lighting engineers considered all the limitations and developed a recommendation based on the use of Silvray "Skylike" units over the tellers' and desk areas, and of cove lighting over the circulation area. The same awkward and unsightly beam condition, however, would still exist.

Both Public Service and Graybar engineers agreed that either of their separate layouts would provide adequate lighting, but that from an artistic viewpoint neither layout was satisfactory. They all decided the only solution for an all around satisfactory

lighting installation required that a suspended ceiling which would conceal beams, air ducts, and permit recessing of lighting equipment, be installed. This the bank president objected to on the basis that the suspended ceiling would result in too low a ceiling for such a wide area.

So the electrical contractors and lighting engineers from both Graybar and Public Service took steps to achieve a better job. They took the bank officials on a tour of inspection to see similar installations. The bank president and other officials soon realized that the engineers had a valid point, and so agreed to go along with a suspended ceiling.

The result was that Graybar and Public Service engineers worked out a new lighting layout jointly, based on use of recessed equipment throughout. The suspended ceiling covered the irregularly spaced beams and air ducts. Over the tellers' and desk areas Litecontrol fluorescent troffers with 45 by 45 degree louver shielding were used. Over circulation and officers' areas, 24-inch square silver bowl incandescent units, Silvray 300-watt "Skylike" luminaires, were used. Troffers over tellers' areas were 3-lamp type, each 12 feet long and spaced on 6-foot centers. Troffers over desk area were 2-lamp type and on same spacings. The recessed "Skylike" units were installed on approximately 8-foot centers, both directions.

In the finished installation, lighting intensities range from 37 footcandles in the circulation area to 60 footcandles in the tellers' area. Deluxe warm white lamps were used in the troffers, to match the color quality of the incandescent units. An excellent blending of both color and intensity are thus achieved.

The electrical contractor had to expand the old electrical system to provide power for the new lighting system and for air conditioning. A new power panel was installed with separate switches for each of two a.c. conditioning units, plus switches for existing feeders to the boiler room. Two new breaker switches were installed, one

for power and one for lighting. Each was a 225-amp frame, with 125-amp trip.

This lighting installation was entered in the New York Section IES "My Most Interesting Lighting Job" contest, and won third place award, which attests to the excellent lighting result achieved.

School Rewires for New Lighting

STUDENTS in the Columbus High School, Columbus, Ga. now study under high-level comfortable lighting which conforms to the standards recommended by the Illuminating Engineering Society. It is provided by a new system of fluorescent luminaires which replace the former antiquated incandescent lighting system using 200-watt incandescent lamps in enclosing glass globes.

Built in 1925, the Columbus High School building is typical of thousands throughout the country. First, the building is too small for today's needs. Second, it has far too few facilities for modern teaching curricula. And third, it has long ago outgrown its electrical facilities.

This school is now in the midst of a modernization program. First phase of this program is completed, which consisted of relighting of all existing classrooms and doing the necessary rewiring for the new lighting system. Second phase, now under way, consists of the addition of a new classroom wing and a new multi-purpose building containing a gymnasium, ROTC armory, rifle range, showers and miscellaneous facilities.

A new electrical service entrance will be installed for the new multi-purpose building, and the old service entrance will be enlarged to provide electrical service for the new classroom wing.

The original electrical service was a 110/220-volt system, with a 400-amp main switch fed by 3-400MCM Type R cables for lighting and miscellaneous

requirements, and with a 200-amp main switch fed by 3-1/0 Type R cables for 220-volt 3-phase power. The 110/220-volt single phase system supplied power to lighting panels, each containing from 20 to 30 branch circuits, with fused protection including the neutral. Lighting outlets, usually four to each standard size classroom, were controlled by 2-pole toggle wall switches, switching both the hot leg and the neutral. The 3-phase service supplied power for ventilating fans only originally, but has since been revamped to also supply 220-volt power for electric cooking and an electric kiln in the ceramics laboratory.

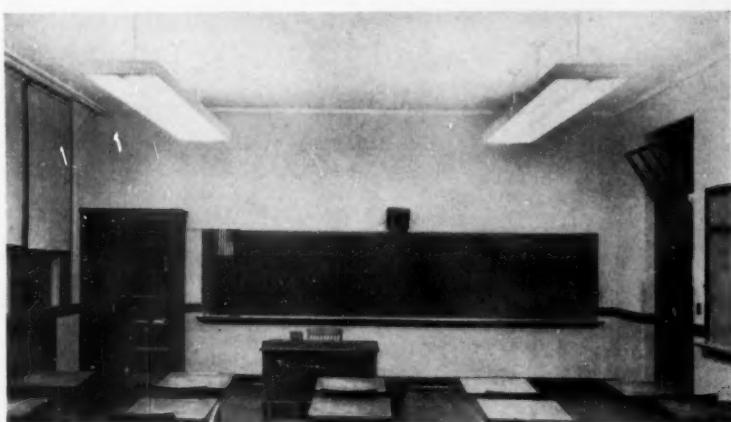
Minimum Rewiring Needed

The original wiring was all No. 12 Type R run in $\frac{1}{2}$ -inch conduit. Lighting outlets were circuited for use of 200 watt incandescent lamps on each outlet. Thus, in order to increase the wiring capacity to meet the needs of the new fluorescent lighting system, it was necessary only to pull in additional circuits in the home-run conduits from each old branch circuit. The old 2-pole switches were replaced with single-pole, which gave full switching

flexibility for the new fluorescent luminaires.

The new fluorescent lighting system was selected so that the original lighting outlets could be used without relocation. By trial installation it was found that by using four general diffuse type louvered luminaires per classroom, each of which was 8 feet long using four F96T12 fluorescent lamps, uniform lighting would result, and that an average intensity of 35 to 40 footcandles maintained would be obtained. This layout was therefore adopted, rather than the usual layout of two continuous rows of 2-lamp luminaires, as no additional rewiring would be necessary. Luminaires used in the Columbus school were the Day-Brite 4-lamp LUVEX units.

Consulting engineer for the Columbus High School modernization is Robert Wiley Smith, of Columbus. Cooperating with him in the selection of the new lighting system were engineers of the Georgia Power Company, and the principal of the Muscogee School District. Stuart Electric Company of Columbus were the electrical contractors who installed the new lighting and did the electrical work.



NEW LIGHTING in classrooms of Columbus High School, Columbus, Ga. is general diffuse fluorescent, using Day-Brite LUVEX 4-lamp luminaires. By installing these units on old existing outlets, and increasing branch circuits by pulling extra wires in home-run conduits only, rewiring costs were kept to a minimum.

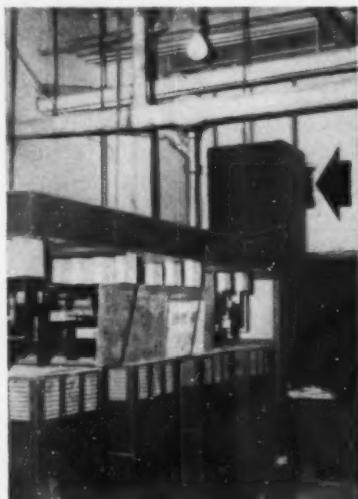
Rewiring for Department Store Renovation

TWO interesting phases of electrical modernization now underway at Titche-Goettinger Company, department store, Dallas, Texas, are the expansion of service and the method of rerouting and using existing branch

conduit. This work is part of a major expansion and renovation project at the store. City Electric Co., Dallas, is handling the electrical work. Accompanying photos point up highlights of the job.



NEW SWITCHBOARD, left, fed at 480 volts, 3-phase, by two lengths of 2000-amp busway in parallel, is mounted facing old, live front switchboard at right. Utility vault is on other side of basement wall in background. Incoming busway to new board can be seen at top in background. Old switchboard is fed at 120/208 volts, 3-phase, 4-wire, from transformer bank in adjacent room.



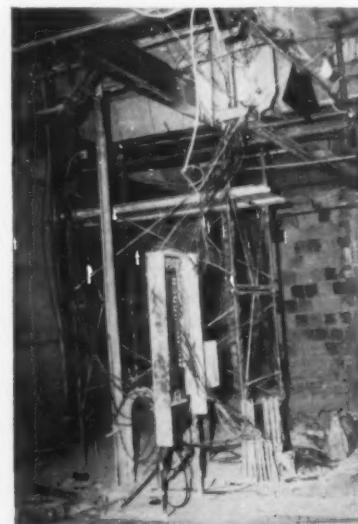
TRANSFORMER BANK in basement is fed at 480 volts, 3-phase through another new switchboard nearby, supplied by a 3000-amp service in this room adjoining main switchboard room. Four transformers shown here—each 300 kva, 3-phase, delta to wye, 480 volts, 3-wire to 120/208 volts 4-wire—are connected in parallel and feed old switchboard in next room by busway through wall (arrow).



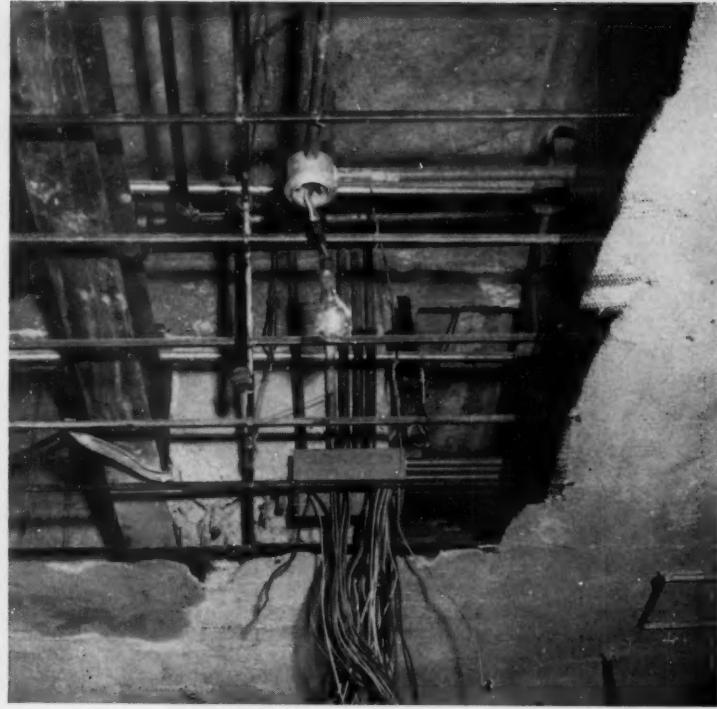
EQUIPMENT INSTALLATION in crowded basement quarters required on-the-job assembly of wireways for connecting equipment. Particular wireway runs were fitted, then assembled and installed. Here, wireway between 1500-hp compressor motor (background) and controller enclosure (foreground) is temporarily suspended by wire as electrician assembles junction.



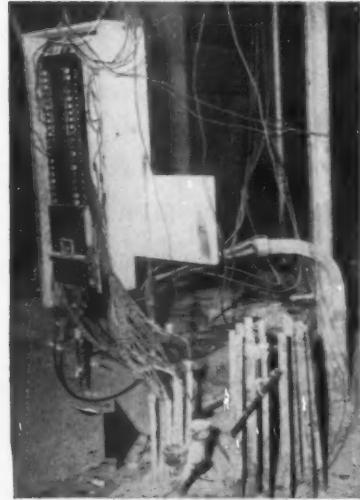
RESISTOR BANK for new 1500 hp compressor motor (left) is shown with pipe and angle iron frame partially completed. Frame parts are being cut and welded in position to form sturdy rack. Wireway at top carries conductors to motor terminal enclosure.



TEMPORARY PANEL (right) is used near riser to be discontinued at third floor level. Floor area just behind panel is filled-over elevator shaft. Lighting panels on floors 1 to 7 were previously located at this location on the different floors. Modernization called for removal of panels along this riser, rerouting of branch conduit to new panel location and removal of this old riser. Concrete column was broken off (arrow) and removed; steel beam (upper left) was added for support.



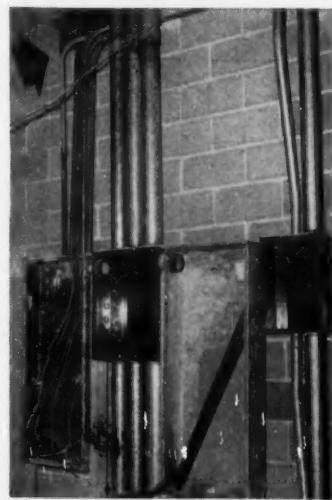
JUNCTION BOX (arrow, left) was installed to pick up home runs which formerly ran from lighting outlets in ceiling slab to discontinued lighting panel. At this stage of construction two runs are already coupled to the box by short lengths of conduit. Home runs are continued from this junction box to a new panel in rear of area. Later stage of construction (right) shows a similar junction box used for rerouting the old home runs from the ceiling slab of the fourth floor. New wires were pulled in the old home runs and branches as well as in the extensions of home runs to the new panel. When the job is completed, the box and pipe will be concealed by the suspended ceiling partially shown at right.



HOME RUNS in foreground (arrow) are stubbed up from floor slab at location of old lighting panel. (Steel rods sticking up just to the right of the conduit are structural rods which were in concrete column that was removed.) Riser conduit in background is to be removed; new risers are to be installed to panel at new location. Home runs shown are to be rerouted to new panel location.



CONDUIT REROUTING of home runs which came up from slab at old panel location was made by cutting a hole in slab and bending stubbed-up conduit down into space above suspended ceiling of floor below. Extensions of these home runs are then carried in this space over and up through slab to panel at new location. Again all new wires were pulled for new circuits.



RELOCATED ENCLOSURE for lighting panelboard (at left) is mounted alongside new riser conduit. Splice box in riser lines (center) provides means of tapping risers to feed large panel at right of risers. Home runs from new junction box in space above suspended ceiling of area beyond wall are shown feeding panel cabinet through hole in wall near ceiling (arrow).



CENTER HIGH BAY lighting fixtures are suspended by means of steel cable from third floor ceiling.

Construction Features Dictate New Fixture Mounting

THREE methods of hanging the same type of lighting fixture were necessary in the conversion of four floors of the Grand Central Palace, New York City, from display and exhibition area to offices.

Biggest problem was lighting 13,200 sq ft of high bay area on the first floor. Three 44-ft bays, each 100 feet long, were to be used as office space having lighting requirements similar to those of offices on other floors with normal ceilings. In height, the two end bays extended from the first floor to the third, the center bay from the first floor to the fourth.

Mounting structures for the fixtures, which were to have a mounting height of 14 feet, were provided by suspending a network of channels and angles from the third and fourth floors by means of wire rope, combined with threaded anchor rod and turnbuckles for vertical adjustment.

Running the entire 100-ft. length of each bay are two pairs of $2\frac{1}{2}$ - by $2\frac{1}{2}$ -in. angles back to back which sup-

port Wiremold raceway running in the same direction. Horizontal stiffeners 13 feet long, each made up of two 3-in. channels back to back, are fastened transversely across the angle pairs, two stiffeners per bay. In addition, horizontal displacement is prevented by 2-in. by 2-in. angles back to back running the entire width of the three high bays and fastened at each end to building columns. All conduit runs from panelboards to raceways and from raceways to columns for branch circuit wiring were mounted on these 2 by 2 angles.

Cables supporting this steelwork are anchored in 5-in. channel set into the third and fourth floors. It was necessary to cut chases into the existing flooring to accommodate these channels over a weekend, since excessive noise would have been objectionable to building tenants during the week.

The second hanging problem was presented by areas of the first, second and third floors having normal ceiling height. The existing hung ceiling was

to remain without modification, hence it was necessary to use outlet boxes existing at locations of previous ceiling fixtures where possible. Where no existing boxes were available, circuits were extended to new boxes at the desired position by means of cut-in BX. New outlet boxes were cut in with a bar hanger spanning two of the hung ceiling carrying channels.

A third modification was necessary on the fourth floor, because of the existing concrete ceilings. Again, existing outlet boxes were used where possible. When fixture hangers were needed where no previous lighting fixtures had existed, new fixture boxes were attached to the ceiling by means of expansive screw anchors and covered with a canopy. Where it was necessary to extend branch circuit wiring, it was done by the use of surface raceway on the ceiling.

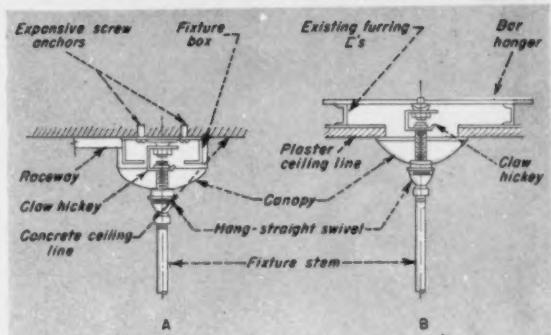
Electrical contractor for the project was T. Frederick Jackson, Inc., New York City; consulting engineer was E. A. Weekes, also of New York.



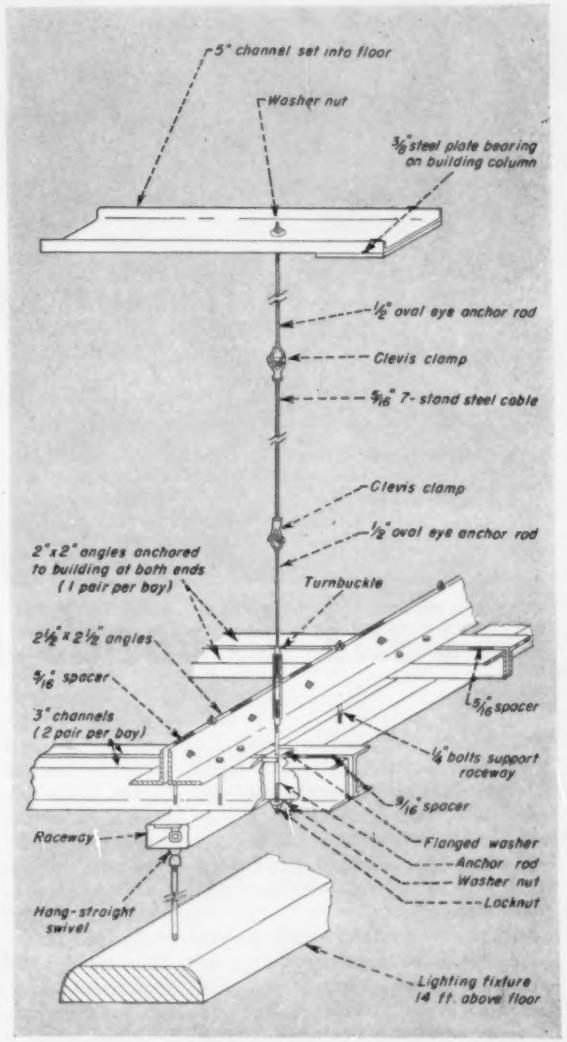
Fixture stems were fastened to existing ceiling boxes where possible (left); other supports were cut into ceiling and fastened to furring channels (right).



Bar hangers supporting fixtures from existing plaster ceiling were inserted with a minimum of cutting and replastering.



CEILING VARIATIONS made two hanging methods necessary. New outlet boxes were installed flush with concrete ceiling of fourth floor (A). On first three floors, fixtures were mounted from bar hangers spanning furring channels of existing plaster ceilings (B). Hangers were secured to channels with wire fastening.



STEEL NETWORK details show method of suspending fixtures in high bay area.



BANKING AREA of the Citizens & Southern National Bank in Macon, Ga., has been air conditioned and re-lighted—both requiring more electric power. Old luminaires were retained, are now lamped with small wattage decorative candle lamps. New lighting consists of 1000-watt Century spotlights recessed in ceiling, which provide 35 footcandles over entire area.

Bank Expands Electric System

THE Citizens & Southern National Bank in Macon, Ga., last year modernized its entire 3-story building. It had moved into this building in September 1933, following a fire in June 1932 which destroyed the entire 7-story bank building it had previously occupied since 1916.

Modernization of this bank's present 3-story building became necessary due to several factors. For one thing, it needed additional room because of its continued growth. The old lighting system was inadequate, and better lighting was needed throughout the

building. The heat and humidity during summer months made air conditioning highly desirable, if not mandatory, for the comfort of customers and employees alike. And use of the latest type of electrically operated business machines required adequate wiring to supply full-voltage uninterrupted electrical service. To meet these demands, all of which involved the use of additional electric power, an expanded modern electrical system of increased capacity would also have to be installed.

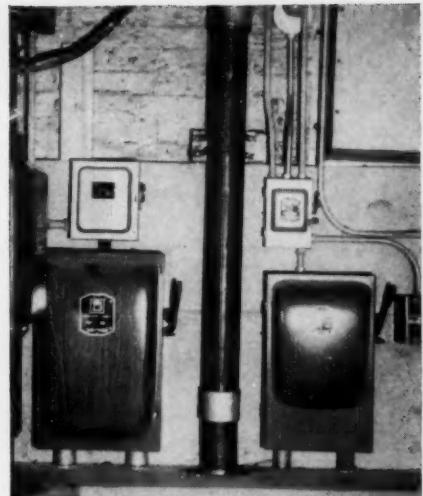
Macon architects Dennis & Dennis

were retained to study these problems and draw up plans for the complete modernization. Electrical design was turned over by the architects to Electrical Engineers of Macon. Contracts were let to various trades for the work involved, including the electrical work, which went to the Macon Electric & Blue Print Company. Georgia Power Company engineers cooperated with the consulting electrical engineers on the supply of additional electrical capacity and on lighting design.

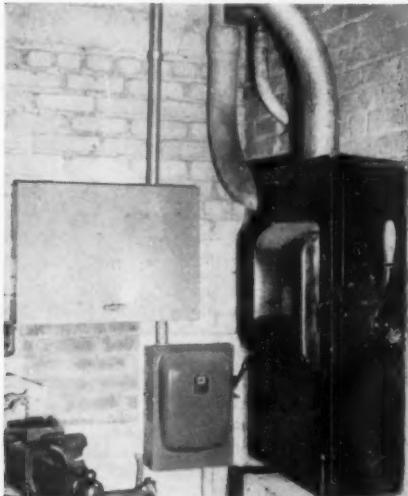
More space was obtained by expanding and modernizing the 3rd floor area



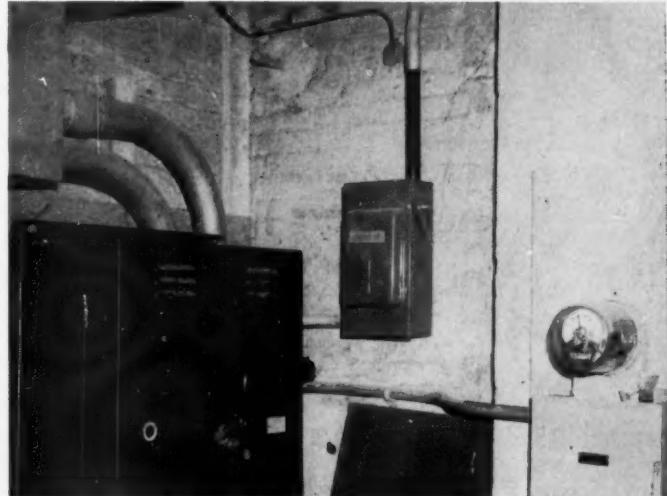
NEW LIGHTING with Smithcraft "Director" units and air conditioning has transformed 3rd floor area into pleasant office space. Intensity averages 75 footcandles. Modernization included structural changes and expanded floor space as well as new lighting.



MORE ELECTRIC POWER for bank's improvements required complete revamping of basement electrical vault. Old 200-amp switch was supplemented by new switches and wire trough.



OLD EQUIPMENT also retained was 400-amp switch formerly serving total load, which is now supplied from 800-amp circuit breaker.



PRIMARY FEEDERS from power company supply 208/120-volt 3-phase 4-wire service through junction box (upper left) to new 800-amp ITE circuit breaker (lower left). Meter and CT cabinet are shown at right.

and by excavating, with special permission of the city, a section of the basement which extended out under the sidewalk on one side of the building. Both areas were air conditioned, and lighted by modern fluorescent lighting equipment.

The main banking area on the main floor of the building was air conditioned and relighted. The old incandescent luminaires of artistic design were retained, and relamped with low wattage decorative type lamp bulbs for artistic effect only. To provide adequate illumination in this area, 1000-

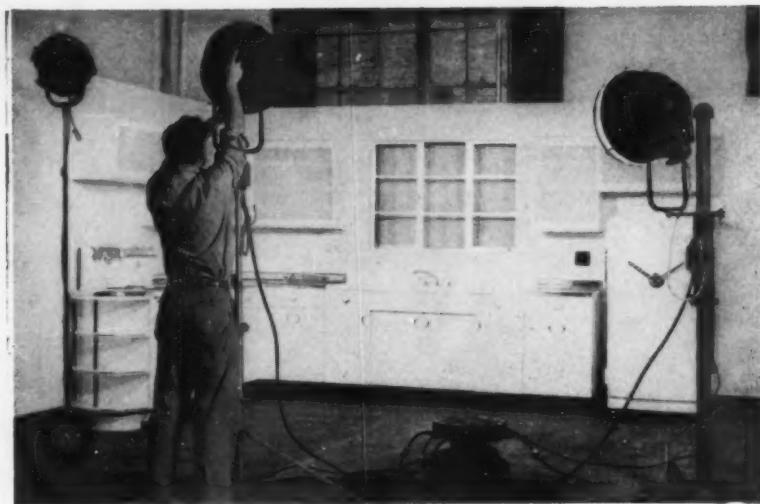
watt Century spotlights were recessed in the 31-foot high ceiling on approximately 10-foot centers. These units are of the low-brightness type which conceal the light source completely, provide about 35 footcandles average intensity over the entire banking area efficiently, and spill light on the walls and historic murals in sufficient intensity to provide a desirable effect.

Electrical modernization included the reuse of the old equipment, which was supplemented with new equipment as required. A new 800-amp circuit breaker was installed, which in turn

supplies an old 400-amp switch and load center, as well as two 200-amp switches, one 100-amp switch, and various other smaller switches, all tied to the lighting and air conditioning branch feeder circuits.

Thus electrical capacity has been more than doubled at a nominal cost, and electric power has thereby been made available to provide greater comfort for customers and employees. The entire project is in keeping with the slogan of all Citizens & Southern banks of Georgia: "Courtesy and Service—C & S."

Rewiring for Photo Studio



ESTABLISHING a modern photographic studio in an old building formerly used for a garage is a sure bet for an increase in service capacity as well as a partial rewiring job. Such was the case when Time, Inc., publisher of *Time* and *Life* magazines, moved its New York City photo studio to new larger headquarters.

The old ac feeder of the combined ac and dc service to the building was removed, and in its place were installed four 500MCM conductors which feed both a new 400-amp service switch installed to handle the photo studio load and the old 200-amp service switch which now feeds the remainder of the

building. The original dc service was left intact. From the new 400-amp service switch and current transformer combination, current is carried to the fourth floor photo studio by means of approximately 50 feet of 4-conductor 500MCM RH cable in 3½-inch conduit. The riser, installed in a stairwell used as a fire exit, terminates in a main distribution panel in the fourth floor photo studio.

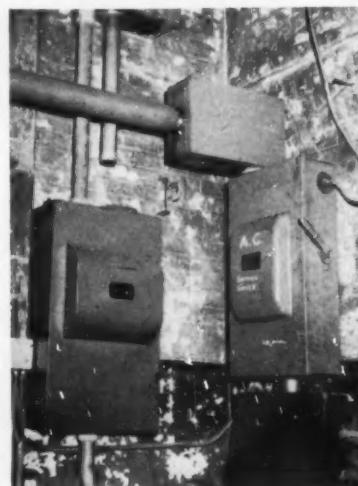
Two panels—one for lighting, the other for power—are fed by the MDP through 100-amp and 300-amp breakers, respectively. The power panel supplies 2 two-pole and 4 three-pole safety switches, as well as miscella-

neous wall receptacles. The two-pole switches (50- and 100-amp) feed two electric ranges used in the preparation of food displays to be photographed, while the three-pole switches (60-amp) provide means of connecting multiple-outlet Kliegl units. Into these units are plugged the various flood and spot lights used for photographic illumination.

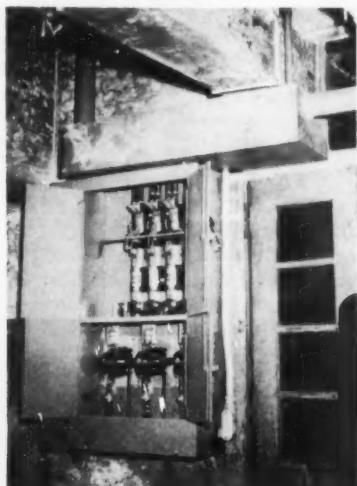
This installation typifies the simplicity with which existing small office buildings may be provided with electrical service for expanding needs. Electrical contractor for the job was B. Eichwald & Co., Inc., New York City.



SAFETY SWITCHES on wall feed portable multiple-outlet Kliegl units; capacities are painted on switches to guard against overloading.



OLD SERVICE entered building in box at top of photo; connection to old ac service switch has been removed. Switch at left feeds dc circuits.



NEW SERVICE feeds combination 400-amp service switch and current transformers. Tap feeds old ac service switch through conduit at upper right.

Pro Rata Plan for Modernization

A BREAKER that failed to trip under a condition of extreme overload started in 1947 a program of electrical modernization that has put one of New York City's 26-story office buildings well on its way to being prepared for any foreseeable increase in electrical load. In addition, it has developed a plan of owner-contractor cooperation and a working owner-tenant financing arrangement.

Routine Trouble Call

First evidence that things were not as they should be was the presence of an excessive amount of heat in the immediate vicinity of a 3000-amp dc service switch in the building's basement. When the bakelite mounting board began cracking, the building's owner called in B. Eichwald and Co., Inc., electrical engineers and contractors, New York City. Investigation showed that the switch contacts had fused because of the heavy overload and lack of maintenance. In addition, the copper on the dc switchboard had become carbonized from heat and dirt in its 30 years of operation since the building's construction.

Immediate corrective measures required around-the-clock work over an entire weekend. The switch was replaced, and all copper on the board was removed and cleaned with emery cloth. Many connections required immersion in special penetrating oils to loosen the bolts sufficiently for cleaning.

An investigation of connected loads followed. Surveys were made of outlets, lighting fixtures and machines; condition of panels and feeders was noted; load checks were made on individual phases of the single existing ac riser. The normal increase in electrical office machines alone over the years had exhausted any reserve capacity existing at time of installation.

Lighting fixtures that had been designed to accommodate 100-watt lamps contained 300- and even 500-watt lamps. Indiscriminate tapping of the ac feeder for both lighting and power loads had created a condition of extreme unbalance among the individual phases. Such overloading had created a deterioration of circuit wire insulation and many burned switches which were no longer safe to operate.

The owner was quickly convinced that more extensive work was required and agreed to the installation of an additional 4000-amp ac main line service to eliminate overload on the dc service. Con Edison installed the first of four ac vaults in the building's basement. Risers were terminated in new enclosed switchgear in the basement. All new risers installed for lighting purposes were 3-phase, 4-wire, 120/208-volt RH wire. Old 3-wire dc cables were reused only where careful investigation showed the copper and insulation to be in serviceable condition. To avoid unbalanced phase currents, no lighting loads were allowed to be fed from the power feeders. Since the modernization work began, a total of 16 new lighting risers and 9 new power feeders have been installed. Old dc equipment (sump pump motors, etc.) is replaced by ac equipment as it becomes unserviceable.

The cost of this increase in ac capacity is being paid by the tenants on a "pro rata" basis. Two systems of computing cost are used, one for power and one for lighting.

Computation of Cost

A tenant desiring to replace old lighting with new pays his share of the feeder cost in proportion to the amount of floor area serviced by the feeder that he occupies. The total cost of the feeder includes a proportion of

the main service switch, distribution board and metering facilities. Assume a riser feeds four floors, a total of 20,000 sq ft of office area, and that the total feeder cost represented is \$8400. A tenant on one of the floors occupying 960 sq ft of space and desiring new ac lighting would thus pay

$$\frac{960}{20,000} \times 8400 = \$403$$

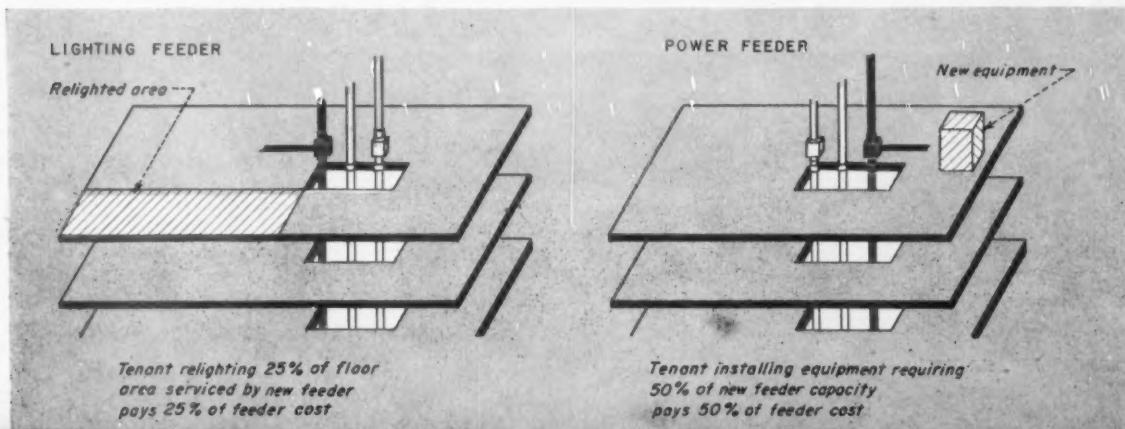
for tapping into the new feeder. In almost every case so far, it has been necessary to remove all existing branch circuit wiring. Old 3-wire dc distribution cabinets are replaced by new 3-phase, 4-wire panels.

Pro rata costs of power feeders, which are not permitted to carry lighting loads, are computed not on a basis of floor area, but according to the proportion of connected load to the current-carrying capacity at that particular floor at available voltage. Assume a tenant desires to install air conditioners requiring 16.2 amps, and that the voltage at his floor will permit a total of 330 amps to be carried by an \$8400 riser feeding his floor. His cost would be

$$\frac{16.2}{330} \times 8400 = \$412$$

for use of the feeder.

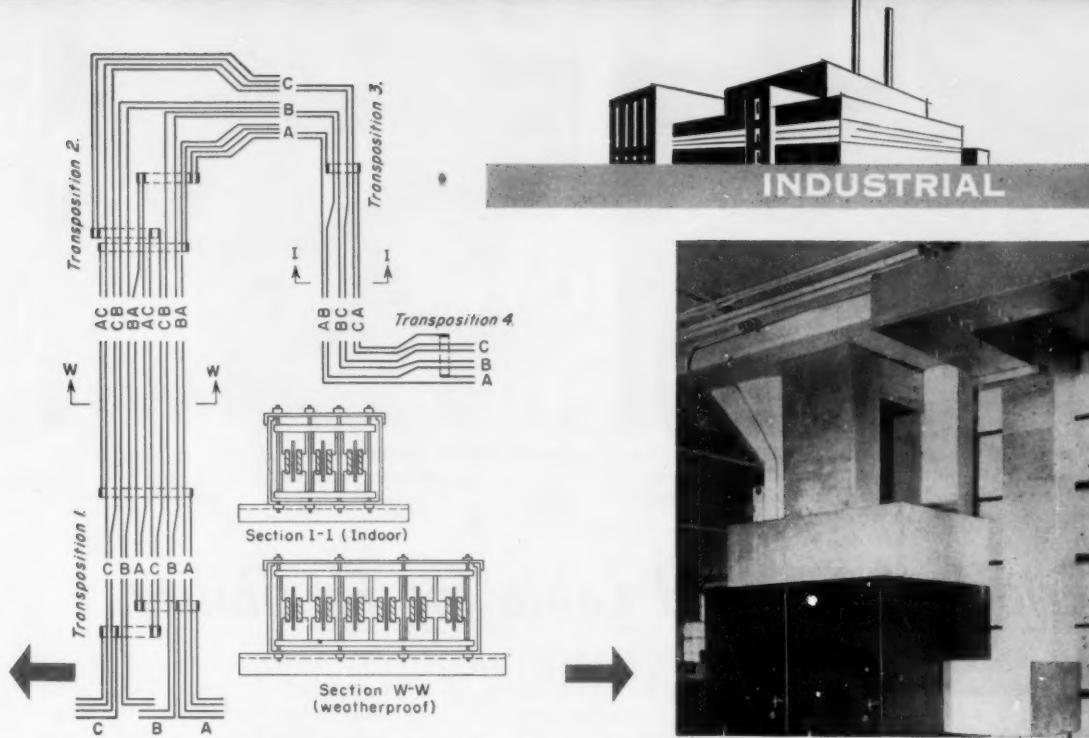
To insure compliance with adopted electrical standards for the building, a standard operating procedure has been set up, with B. Eichwald and Co., Inc., as the management's representative. Plans for contemplated rewiring are submitted by the tenant for approval, and after work has been completed it is checked before connection to the riser. Records of connected loads on each floor and each riser provide accurate, up-to-date information on the progress of the conversion and insure well balanced, safe distribution.



INDUSTRIAL Electrical Modernization

Electrical rebuilding in industrial plants accommodates increased lighting levels, new production equipment, materials handling and processing.





HIGH EFFICIENCY BUSDUCT is run up outside of old industrial building to bypass interior obstructions (left) and is also installed in an inverted position close to the ceiling (right) as a low-loss distribution means to remote load centers. Bars are arranged in split-phase pairings (and are also regrouped) in various transposition sections. This installation included 380 ft of exterior weatherproof 4000-amp busduct and 280 ft of interior 2000-amp duct.

Weatherproof Ducts Bypass Obstructions

INSTALLING new feeders between a substation or switching center and remote sections of old reinforced-concrete buildings can be complicated by the existence of such intervening obstructions as thick floor slabs or structural walls, crowded service shafts, insufficient clearances, a multiplicity of piping, or ductwork related to other utilities. All of these problems were present when the recent boom in air conditioning equipment made it imperative that the Carrier Corporation provide considerable additional power to several upper floors of their assembly plant in Syracuse, N. Y.

In that case the solution was provided by electrical contractors Hillebrand and Owen, who suggested installing low-loss weatherproof busduct on the outside of the building, with enclosed bus bar take-offs entering upper floors near local breaker cabinets. This method of routing minimized structural alterations, erection difficulties, length of runs and then-scarce materials and labor.

As installed, the 3-phase, 3-wire,

440-volt, 4000-amp exterior weatherproof installation extends approximately 380 feet in overall length, measures approximately 11 by 24 inches in cross section, is formed from 14-gage galvanized steel, is weatherproofed by cover gaskets with fibre washers beneath all bolt and nut heads, and encloses twelve 4- by $\frac{1}{2}$ -inch copper bars supported by insulated brackets on 20-inch centers.

To minimize line reactance and obtain better current distribution by combining electrical skin and proximity effects, the enclosed 12 bus bars (4 per phase) were interleaved to form six split-phase pairs of bars (2 pairs each of phasings AC, BC and BA), and each split-phase pair of bars was segregated by continuous $\frac{1}{2}$ -inch thicknesses of fibrous glass insulation. This interleaving of bars was accomplished in an initial transposition section, and original grouping of bars was restored at each take-off point through similar re-transposition sections. The installation is powered through a 4000-amp breaker and take-offs terminate in

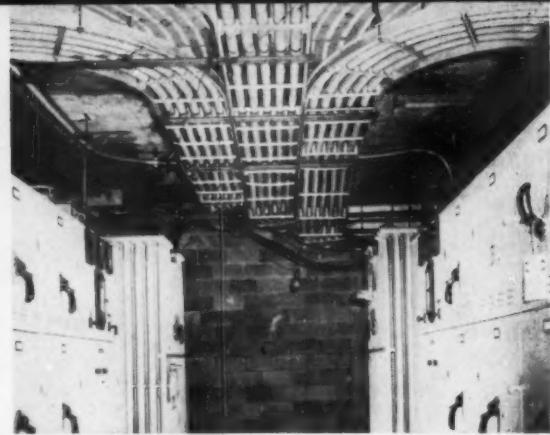
2000-amp breaker enclosures located on the various floors.

This same method of interleaving is again practiced inside the building (but on a smaller scale), between the 2000-amp breakers just mentioned and local load centers serving standard plug-in busduct systems through 600-amp breakers. These interior feeder busways are installed close to ceilings, being secured to channels which, in turn, are bolted to ceiling slabs. As in the exterior duct, bars measure 4 by $\frac{1}{2}$ inches, but these interior installations contain only 6 (rather than 12) bars each, interleaved through transposition sections to form one pair of phasing AC, BC and AB. In this case also, bars are again regrouped in their original arrangement through final transposition sections.

This high-efficiency installation combines reliability with ample capacity for all present and future power requirements. It also reduces maintenance, provides ready accessibility, minimizes voltage drop, and raises plant power factor.



MILES OF CABLE were quickly routed along corridors in this high conversion job, with ladder-type trapeze hangers secured close to beams. This arrangement facilitated easy inspection, alterations, additions, installation and salvageability.



LARGE RADIUS SWEEPS were used where changes in direction occurred, with interlocked armor neatly secured to cross-arms of trapeze hangers. Flexibility of installation permitted bypassing of many physical obstructions.

Interlocked Armored Cable for Flexibility

THE necessity for speedily converting a down-at-the-heels Cleveland storage depot into a heavy-duty 3-shift industrial plant recommended the use of interlocked armored cable as a versatile high-voltage distribution medium.

These large-diameter flexible wireways were supported by lightweight open ladder-type trapeze hangers secured to the undersides of beams and reinforced-concrete floor slabs. By this means, (1) many physical obstructions were bypassed, (2) feeders were quickly routed along corridors or above

switchgear, (3) long cable runs were pulled in easily, (4) full-length inspection was constantly possible, (5) splices became unnecessary, (6) alterations or additions to the distribution system were easily accomplished, (7) installation time was materially reduced and (8) the cables remained highly salvageable.

Pulling operations were simplified and facilitated by temporarily installing removable rollers at close intervals along the various trapeze racks, and also by using truck-mounted motorized winches, blocks and tackle.

Changes in cable direction were accomplished via special racks having large-radius sweeps, and the cables, after installation, were held in neat, secure alignment by heavy cord loops passing over the interlocked armor and beneath the supporting crossarms of the racks.

This interlocked armor, installed for G.M.'s Cadillac Division by electrical contractor H. B. Durkee of Cleveland, Ohio, enclosed 3-conductor 600MCM varnished cambric cable carrying current to the large variety of utilization equipment at 4800 volts.



SPRAY-PAINTED metal parts for pull boxes, switchboards, control panels and bus troughs are carried by a motorized loop-arranged conveyor system through a 180-lamp 45-kw infrared drying tunnel. Baking cycle averages 5 to 7 minutes; gives parts a smooth wear-resistant finish; saves time, space, labor.

Conveyor and Infrared Oven Cut Baking Time

RESHLY-PAINTED metal parts for pull boxes, control panels and other electrical distribution products were formerly air-dried on space-consuming racks in Powerlite Switchboard's fabrication plant in Cleveland, Ohio. Today, however, parts are dried in 1/6th the time, thanks to the installation of a motorized conveyor system and an infrared drying oven. This modernization idea has materially stepped up production, provides a more durable satin-like finish for the parts, conserves both space and labor, and has directly slashed manufacturing costs.

Installed by Powerlite's electrical maintenance department under the direction of plant superintendent Ben Kovar, the conveyor is laid out in the

form of a loop, so that baked parts may be removed from the moving hooks just a few feet distant from the point where they were first suspended and spray painted.

In the drying tunnel, 180 lamps of the 250-watt size are arranged in four banks, one above another on two sides of the tunnel. This permits part of the 45-kw load to be turned off when parts of reduced area are being carried.

The drying cycle averages between 5 and 7 minutes and, even when loading and spraying times are added, the complete elapsed time for these operations is only 20 minutes. Since the formerly used air-drying method consumed up to 2 hours, it is apparent that time savings up to 85% are now obtained.

Industrial Plant Installs All-Electric Heating System

USE of electrical heating equipment for industrial application achieved six important objectives for the Melin Tool Company of Cleveland, Ohio, when they abandoned their former coal-burning system as part of their plant-wide modernization program. For example, the installation of ceiling-mounted electric space heating units and the simultaneous abandonment of their fuel bin, furnace, blower fan and duct system released 8700 cubic feet of space for revenue-producing manufacturing purposes. Also, by using time clocks, it became unnecessary for a janitor to arrive at the premises around 4 or 5 a.m. to open drafts or stoke the furnace. Through the use of individual thermostats on each electric heater, formerly prevalent variations in temperature were eliminated, drafts were reduced, employees suffered far fewer colds during the winter months, and absenteeism dropped noticeably. Since coal and ash dusts no longer were present, plant cleanliness was improved and precision tools required less frequent maintenance. With heating ducts no longer in existence, the cost of sweeping and vacuum cleaning the system (usually performed in overtime) was wiped out. And, with no ashes to remove, coal to shovel, ducts to clean or parts to replace, service and maintenance charges were drastically cut.

Translated into basic gains, this conversion resulted in greater efficiency, comfort, dependability and flexibility. It also conserved floor space and labor. Moreover, it resulted in an economic saving of nearly \$300 annually. This last benefit was particularly gratifying, because all-electric space heating had previously remained untried for industrial plants in the Ohio area. It was definitely a pioneering experiment and, since windows comprised nearly 50% of all areas in the Melin plant, abnormally high heat losses were anticipated and encountered, calling for more equipment than would usually be required.

An analysis of comparative costs, relating the all-electric system to the stoker-type furnace employed, is both interesting and revealing. For example, with the old system, average annual fuel bills were \$1800 and maintenance (including labor for stoking,

cleaning, ash removal and replacement of worn parts) totalled another \$1000. Operation of the blower motor added \$100, resulting in an overall operating charge of \$2900. Since the original installation cost \$4800 (financed at 6%) and had an estimated life of 10 years, the amortization and interest charges amounted to \$768 a year. And, since the old system occupied 8700 cubic feet of space which was later used for other purposes, an annual space "rental" should be included. Using the very nominal figure of 5 cents a cu. ft., this charge would be \$435, and total annual charges related to the old system would add to \$4103.

With the new installation, operating charges (with utility rates averaging 1.8 cents per kWh) amount to \$3359 annually, while amortization and interest charges add the sum of \$462 to this figure and bring the total charges for the all-electric installation to \$3821. In this second instance, the amortization considers an original installed cost of \$4200 for the equipment, an estimated life of 20 years, and the same interest rate of 6%. This comparison of costs indicates a net annual saving of \$282, but it is confidently expected that this annual saving will increase with operational knowledge.

The new heating system, installed by the Service Electric Construction Company, utilizes Electromode space units, and the initial plan was prepared on a rule-of-thumb basis of one watt of electric heating capacity for each cubic foot of plant space. This resulted in placing a 10-kw heater in each corner of the manufacturing area, a unit of similar size located near the window line every 30 feet, two 15-kw heaters at the center of the area for early-morning booster purposes, plus several smaller heating units to compensate for local problems and construction irregularities. After the original installation had been completed, minor adjustments were made on thermostatic and time-clock controls.

This progressive modernization of the Melin heating system has stimulated considerable favorable comment pertaining to the use of electrical equipment for industrial space-heating purposes, for advantages are numerous and the economic gains are specific.



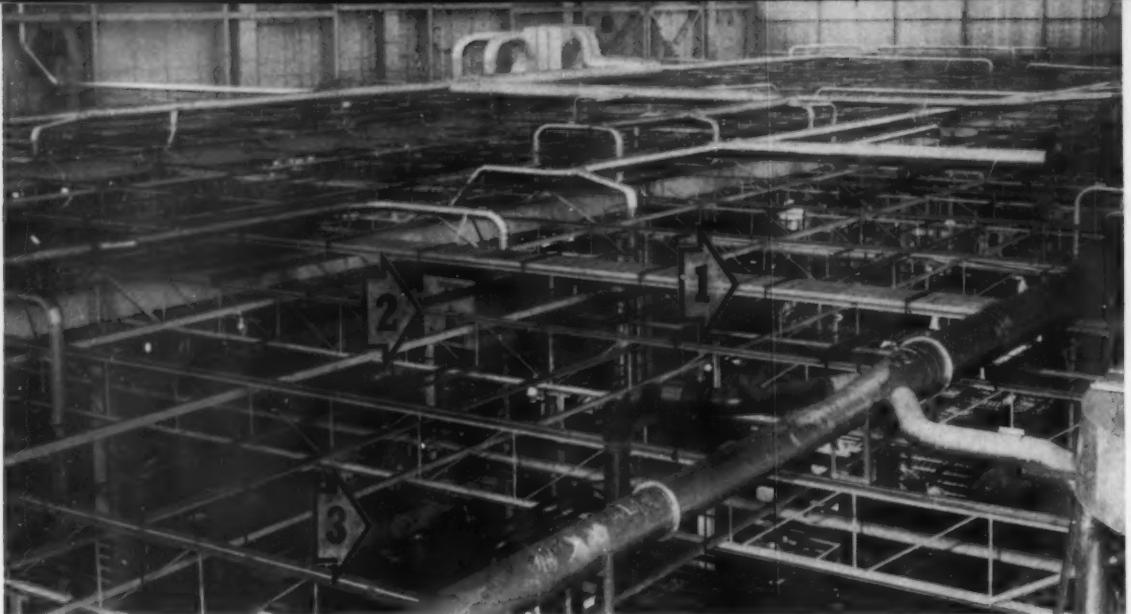
WHERE THE FURNACE once stood, employees now work at precision instruments and machines; tools and parts are stored; inventories are kept up to date. Removal of the boiler and associated equipment released 8700 cubic feet of space for other purposes.



UNIT HEATERS of 10-kw capacity are located approximately every 30 feet along the outer walls of the plant. Time clocks place these units in service at 5 a.m.; maintain a 76-degree temperature through the working day; automatically return to 55 degrees at night.



TWO BOOSTER HEATERS of 15-kw size are mounted in the center of the manufacturing area for early-morning pick-up purposes. Units of 10-kw size are placed in each corner, while smaller units are strategically positioned to meet local heating requirements.



LOOKING DOWN on steel supporting grid in 36-ft. hi-bay area over machine tools. Bar joist system provides convenient 18-ft. mounting height for power distribution and other utility lines. Note 3,000-ampere feeder duct (1), 800-ampere tap-off breaker (2), and 400-ampere plug-in duct (3).

Low-Bay Flexible Power Distribution

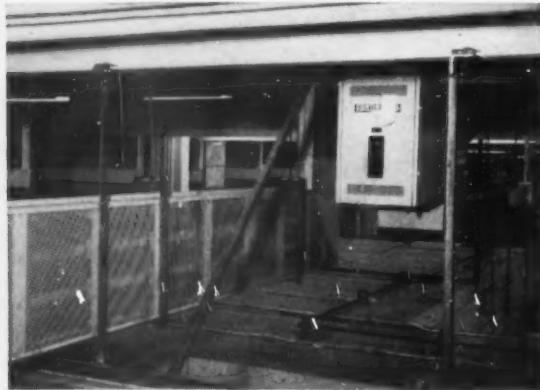
WHILE since construction of the gigantic Willow Run bomber plant, near Ypsilanti, Mich., its electrical distribution system has been altered or modified to meet production requirements. Original electrical design left the 36-foot high-bay plant areas free of overhead wiring, confining electrical facilities to underground systems and wall locations of equipment. The first modification came when Kaiser-Frazer took over the plant for automobile production. The second change occurred more recently when the Detroit Transmission Division of General

Motors Corporation acquired the plant for production of automatic transmissions.

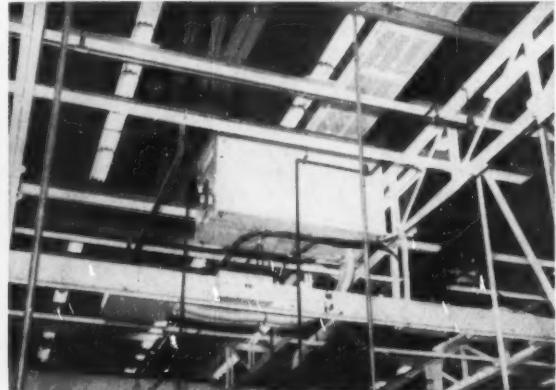
When GM engineers duplicated the burned-out Livonia operation at Willow Run, they faced the problem of providing low-bay flexible electrical distribution in the high-bay areas. To provide service to more than 4,000 machine tools in the fabrication and assembly lines, they effectively lowered the ceiling to an 18-foot height by installing a steel bar joist grid supported by columns and girders. On this are mounted the complete elec-

trical distribution facilities plus other utility systems.

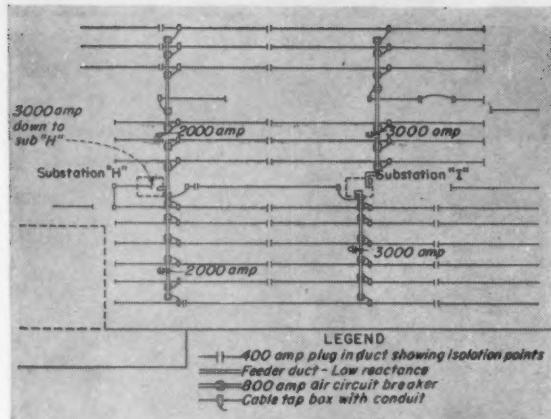
Approximately 20,000 feet of 400-ampere, 3-phase, 440-volt, plug-in bus duct is suspended in parallel rows from the bar joist grid using a variety of trapeze type hangers and beam clamps. Individual rows of distribution bus duct are fed by overhead lateral lines of 3,000-ampere and 2,000-ampere, low-reactance feeder bus duct which drops down at column locations to existing underground substations. Here, the feeder ducts (totalling 3,700 feet) connect to switchboard bus bars



JUNCTION POINT where 3,000-ampere low-reactance feeder duct ties in to 2,000-ampere lateral subfeeder bus duct. Circuit-breaker cubicle at right ties plug-in duct to 2,000-ampere subfeeder.



PLUG-IN DUCT for power distribution to individual machines is suspended from steel grid by trapeze hangers. Tap-off circuit breaker with flexible conduit connection above is fed by a 2,000-ampere subfeeder duct.



TYPICAL SECONDARY POWER distribution over portion of the machine tool area. Note high-ampere feeder duct from substations serving parallel rows of distribution bus duct with isolation sections for emergency ties.

served by the original 2,000-kva, 13,800/440-volt transformers.

About 80 800-ampere circuit breaker cubicles installed in the supporting grid connect the 400-ampere plug-in duct to the feeders. Service to individual machines consists of conventional flexible cord drops from bus plug to motor control. Spring-suspended clamps at grid level above machines and duct lines keep the connecting cords taut.

The automatic transmissions are assembled in a 600-ft. by 300-ft. dust-free, air-conditioned room at the end of the fabrication lines. Power service is provided by bus duct, and fluorescent lighting fixtures are mounted to lines of trolley duct. Two 800-hp, 4,800-volt synchronous motors with associated controls and two 1,000-kva, 13,800/-4,800-volt transformers with necessary primary feeders were installed at this

time. These motors operate two 4,000 CFM Ingersoll air compressors.

Perhaps the most remarkable feature of this alteration was the speed with which the installation, and complete reproduction of the Livonia setup, was made. Hydramatic transmissions were coming off the Willow Run lines within 85 days after the Livonia plant was razed. To help General Motors accomplish this "industrial miracle", Turner Engineering Company and Brooker Electric Company of Detroit pooled their electrical construction know-how, supervisory talents, tools and manpower. Electricians worked two 12-hour shifts, seven days per week, with a peak crew numbering more than 1,000 men, to win the race against time. As it turned out, General Motors' original time limit was clipped by five days.

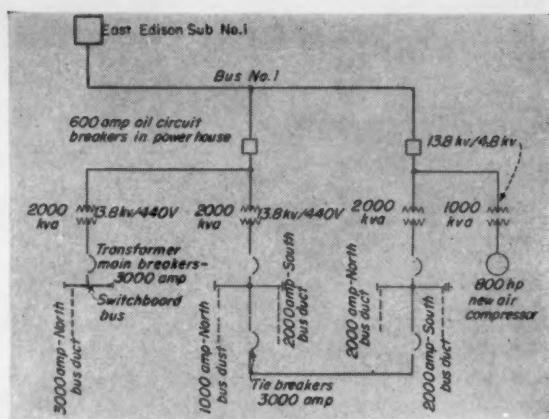
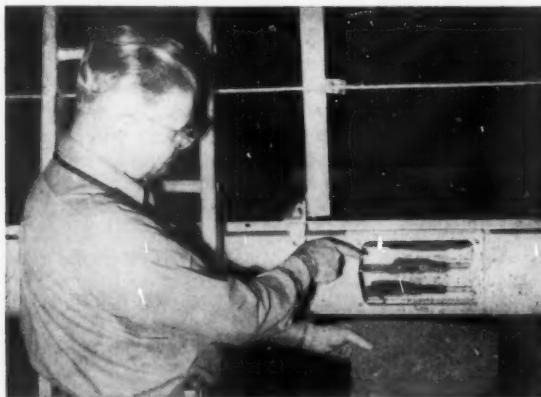


DIAGRAM OF PRIMARY power feeders and secondary ties on existing underground substation system. Feeder bus duct of secondary power distribution is connected to substation switchboard bus.



VENTILATED FEEDER DUCT of 3,000-ampere, 440-volt, 3-phase capacity comes up from existing basement substation through steel casing (for personnel protection) and "fence" for mechanical protection against industrial trucks.



ISOLATION SECTIONS permit emergency connection between 400-ampere plug-in bus duct runs fed from different underground substations. Screw covers on access holes are painted bright red for quick identification.



FLEXIBLE CABLE DROP connects bus plug to control equipment on individual machines. Cable is held taut by straight clamp fastened to messenger cable on duct support plus ceiling-mounted, spring-suspended clamp above machine.

Modernization Simplified with R-52 Lamps

MANY industrial plants, mills, foundries, warehouses and assembly buildings are modernizing their lighting systems through the simple expedient of replacing old fixtures with reflectorless R-52 lamps, like those used in the high-bay sections of the Stahleker Steel Company in Cambridge, Mass. There the lamps are spaced on 20-by-30-foot centers at mounting heights of 30 feet, and the resultant illumination averages 18 footcandles (after a hundred hours of use) over the 29,000-sq. ft. floor.

As indicated in the accompanying illustration (taken when the installation was half completed), the improvement was infinite, for the former lighting system consisted of 200-watt lamps in standard industrial RLM reflectors on approximate centers of 40 feet in both directions. With the old system, illumination was not sufficiently high to register on a light meter and, although the installation resulted in a 5-kw lighting load, the dim environment fostered misplacement of parts, minor



BEFORE AND AFTER results are combined in this single photograph, taken mid-way through a lighting modernization undertaking wherein 750-watt R-52 lamps replaced widely separated 200-watt lamps in RLM reflectors. The installation jumped the lighting load from 5 to 35 kw and increased illumination to 18 fc.

mishaps, a lower quality of workmanship and general inefficiency.

Since the new R-52s are 750 watts each, the modernized lighting system represents an increase in load of 30-kw; but, far more important, it has paid large dividends in improved efficiency, safety and morale, plus greatly reduced maintenance.

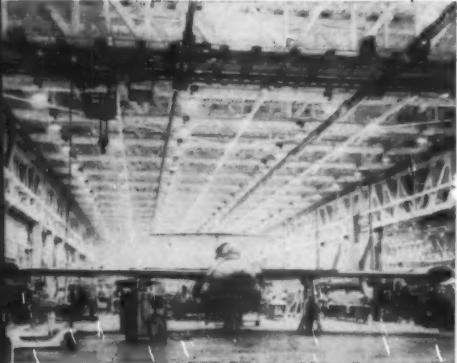
In addition to the fixed installation, two 500-watt R-52 lamps are mounted in shock-absorbing sockets on each of the two travelling cranes, providing a kick of light which results in 35 foot-candles on the immediate work area.

This installation was installed by

electrical contractor J. J. Reddington of Boston over two weekends, resulting in minimum inconvenience for the customer. Planning was by Norman Ticehurst of the Cambridge Electric Light Company.

Since it is possible to over-dramatize lighting modernization projects merely by underexposing a "before" picture and slightly overexposing the "after" view, the accompanying illustration is of particular interest because—on the same piece of film and with the identical exposure and lens aperture—the half-completed job is shown in a true visual "before and after" comparison.

Aircraft Plant Modernizes Lighting



LIGHTING in high bay area of Northrop Aircraft's Plant 3, Hawthorne, Calif., has been modernized by replacing old 500-watt incandescent system with new fluorescent mercury (400-watt JH-1) lamps in Westinghouse ventilated high bay reflectors. Intensity jumped from 10 to 35 footcandles, and new lighting is of much better color quality.

NORTHROP Aircraft, producers of Northrop Scorpion F-89 all-weather interceptors for the U. S. Air Force, has relighted their Plant No. 3 in Hawthorne, Calif. The new lighting system, installed in the high bay area of the plant, replaces an old incandescent system using 500-watt deep bowl porcelain reflectors which provided approximately 10 footcandles.

The new lighting system uses 274 Westinghouse 400-watt, Type JH-1 fluorescent mercury lamps, installed in ventilated high bay Westinghouse reflectors. These reflectors are mounted 30 feet from the floor, on 12½-foot by 20-foot spacings, provide 35 footcandles of "golden white" illumination maintained in service. Use of ventilated type reflectors drastically reduces dust accumulation on the lamps and in the reflectors.

Fluorescent-mercury lamps were selected for this relighting job because

of their inherent high efficiency and for an improved color quality of illumination. On an approximately equal wattage basis the lighting intensity has been more than trebled. And the better color quality of the new fluorescent mercury lamps makes it easier to read the color-coded wiring and piping used in modern aircraft. The longer life lamps cut maintenance costs materially compared with the former 1000-hour incandescent lamps.

Power is supplied to the new lighting system by a completely new 120/208-volt 3-phase 4-wire wiring system, installed by Newberry Electric Company, Los Angeles. Single lamp ballasts were installed, one to each lamp, and were mounted on trusses directly above the reflector units. Each ballast operates from a 120-volt single phase branch circuit, and circuits are staggered so that loads are equalized between the three phases throughout the area.



BEFORE MODERNIZATION, this metal pattern shop combined fixtures of several types mounted at varying heights in several directions. Neither symmetry nor functionalism was apparent. Brightness contrasts were extreme, ceiling was littered.



UNIFICATION of fixture type, increasing mounting heights, placing units in continuous rows, repainting walls and ceilings, and following established lighting maintenance procedures obtained and maintained high illumination and high morale.

Industrial Relighting Ups Workmanship and Morale

A MODERN lighting installation, combining new fixtures with a high-reflectivity painting program, accomplished four objectives for the Master Pattern Company of Cleveland. First, it made the shops look larger, cleaner, neater. Second, it eliminated shadows on work benches and greatly reduced brightness contrasts. Third, it resulted in improved accuracy of work, fewer errors and elimination of eye strain. And fourth, it materially boosted employee efficiency and morale throughout the plant.

As shown in the photograph taken prior to revamping, fixtures were of many styles and types, were mounted at varying heights, were installed without apparent pattern or plan, frequently concentrated light over aisles while machines were left in shadow, created the impression of a low, dark ceiling, combined lamps of several Kelvin temperatures without reason, and delivered uneven and unsatisfactory intensities of from 10 to 25 footcandles to machines and bench tops. Fixture pendants, flexible connections and a maze of pipes, chains and drop cords also added to the harsh, unsightly and uncomfortable atmosphere which existed in the several shops, offices and storage areas.

The revised lighting plan—installed by Master Pattern's own maintenance

department under the direction of plant superintendent M. Pierie and in accordance with specifications prepared by the Cleveland Electric Illuminating Company—utilizes 2-lamp industrial direct fixtures in shops and storage sections, 3-lamp vapor-proof units in the paint area, and 4-lamp direct-indirect luminaires in offices. All lamps are 40-watt 3500-degree white fluorescents, reflectors being suspended approximately 10½ feet above the first floor (2 feet below ceiling slabs) and 9½ feet above the second floor.

Typifying the new look is the metal pattern shop, where 101 fixtures are suspended end-to-end in various groupings to provide between 70 and 75 fc on working surfaces. Continuous rows are located functionally, suspended above forward lips of wall-lining benches, or passing above the many milling machines, layout plates, lathes, sanders, drill presses, shapers and grinders located in the central floor area. Since these various free-standing machines are arranged in parallel lines, the lighting plan presents a harmonious appearance while remaining strictly utilitarian in principle.

Raising the fixtures and placing them in continuous rows also minimized the conglomerate mass of chains and connections, created an illusion of greater height and expanse, and greatly con-

tributed to the new impression of orderliness and efficiency. Also, by using light pastel colors on walls and painting ceilings a flat white, inter-reflection was improved and brightness contrasts lessened.

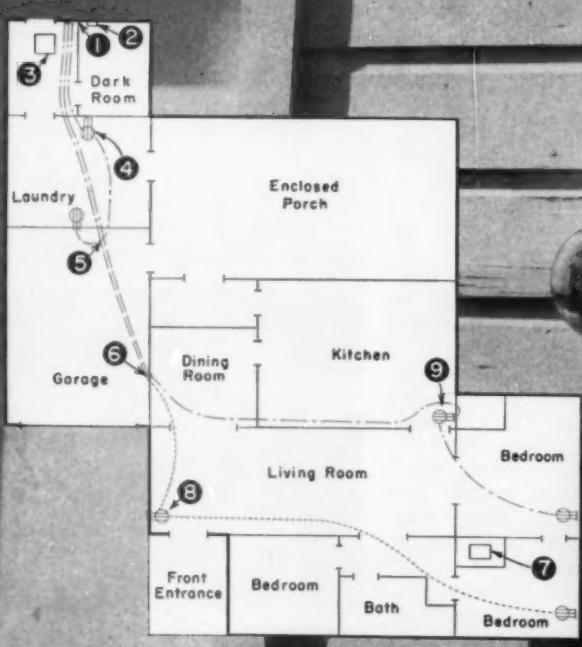
The final "proof of the pudding" may be summed up in the words of superintendent Pierie who maintains that, "Where tolerances of a thousandth of an inch are frequently specified, good lighting, regardless of cost, is a justified and inexpensive investment in product improvement."



ACCURACY in the order of a thousandth of an inch became common practice when this layout table was spanned by two continuous rows of 2-lamp fixtures on 5-foot centers to provide a shadowless illumination of 75 footcandles to this critical working surface.

RESIDENTIAL Electrical Modernization

Succeeding waves of new appliances and electrical utilization devices impose new requirements for electrical accessibility, capacity and control on existing wiring systems.





Remodeling House Wiring... A Job Close-Up

On a typical residential modernization job, O. K. Chapman and G. W. Ford, electricians with Metcalfe Electric Co., electrical contractors, Ft. Worth, Texas, are shown here installing a larger service and running 220-volt receptacle circuits for air conditioning. Details and progress of the work are shown in the photos.



SERVICE MAST was cut to proper length, meter pan mounted on one end and slight bend made at other end to allow flush mounting of mast on building when service head is connected.



DOUBLE TEAMING on assembly of the mast, Ford (left) and Chapman pulled three No. 4 TW service conductors into the mast. Each conductor was pulled in mast and cut to length.



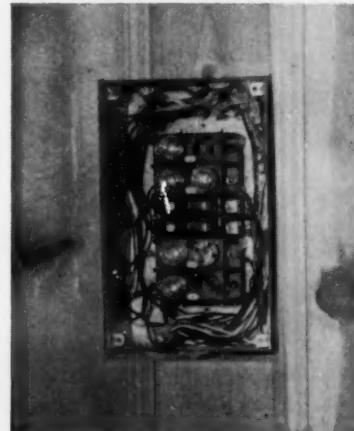
SERVICE HEAD was mounted on one end by Ford while Chapman wired the line terminals in the meter pan. Assembly of the service mast up to this point was made in a matter of minutes.



BREAKER ENCLOSURE for one 40-amp and three 20-amp double pole CBs (SE disconnect and protection) was coupled to meter pan and wired to service conductors. Ford wired meter pan; Chapman made connections in enclosure.



MOUNTING POSITION OF SE breaker enclosure was marked on rear wall (1) and a hole cut through to pass conductors from enclosure through space in wall to old SE panel and to attic space. (Temporary hookup of new SE, opposite page.)



OLD SE PANEL (2) just inside rear wall is 120/240-volt panel with six 120-volt circuits. Formerly fed by three No. 8 service conductors, panel was retained as sub panel fed from 40-amp 2-pole CB in new SE enclosure.



CIRCUIT RUNS of 3-conductor No. 12 non-metallic sheathed cable were started near the SE location through trap door to attic crawl space (3). Here, Ford feeds cable to Chapman who is crawling forward over laundry-room to feed cable to new laundry-room outlets.



220-VOLT OUTLET, here being installed by Ford, is fed by No. 12 cable from 20-amp CB in outside panel, through attic space and down in wall between darkroom and laundry (4). Circuit continues up across attic, into garage and down to back of another outlet.



THREE CIRCUITS come through holes, which Chapman drilled, from attic crawl space to rear of garage (5). Gray-colored cable, continued from outlet on other side of laundry, was carried down wall and into back of second outlet in laundry. Black cables were carried into house.



CRAWL SPACE under house is investigated by Chapman, after breaking away some of side garage wall (6) to find possible paths for carrying cable from garage to outlet locations in house.



DOWN UNDER house, into crawl space below floor, goes Ford. Here, flashlight in hand, he enters crawl space through trap door in closet (7). Under house, he assists Chapman in running cable from garage through crawl space to outlet locations.



BRACE AND BIT whirring, Chapman, directed by Ford who is lying on his stomach in crawl space just behind wall, drills through 2x8 into crawl space from garage (6). One cable from hole in rear garage wall was then fed over garage rafters, down wall shown here and into crawl space.



CHAPMAN PULLS cable which Ford pushed up from crawl space to outlet location (8). Ford, who is in crawl space right under Chapman, first had to drill hole through floor boards at an angle up to outlet. As shown in plan, circuit continued to outlet in front bedroom, where installation details were similar.



KITCHEN OUTLET (9), here being wired by Ford, is fed by 3-cond. No. 12 non-metallic sheathed cable, carried in attic space from garage. Chapman, in attic space, was unable to feed down in wall at outlet position. It was necessary to come through ceiling in closet behind outlet and then feed outlet through wall.



NEW 100-AMPERE cabinet fed by single-phase, 3-wire service. The 60-ampere pull-out block on left is for house circuits, that on right for future electric range circuit.



INSTALLING 3-wire service entrance cable on building exterior. Note existing 2-wire service drop above. Electrician is drilling wall to set expansion shields for cable clamps.



METER IS MOVED to this outdoor cabinet where electrician is adjusting connection block for reinstallation of meter. Service cable leaves bottom of cabinet and goes through concrete wall.

Larger Residential Service Capacity

. . . is the goal of Chicago's initial home wiring modernization campaign. Three contractors on pilot project offer "standard package" at set price.

CHICAGO'S electrical industry is aiming a promotional campaign at the heart of residential electrical inadequacy—the service entrance. By concentrating its initial efforts on this foundation stone of home wiring, the Electric Association hopes to break a bottleneck now restricting efficient use of modern appliances and pave the way for further upgrading of home wiring through its Better Wiring program.

Three electrical contractors are operating in the program by offering homeowners a "standard package" 100-ampere capacity service installation at a set price of \$119. Wigdahl Electric Company is operating a one-square-mile, 2,000-residence pilot project on Chicago's north side. Gibson Electric Company is handling a similar project on the west side. Service Electric Company is doing the same on the south side of the city. A direct mail folder and letter campaign with a return postcard is followed up with telephone calls. Interested homeowners

then receive personal calls from a utility representative and the contractor to fully answer all questions and clinch the sale. After a 90-day trial period, the three pilot projects will be carefully analyzed and evaluated. The program may then be expanded to cover the entire Chicago area and will include all interested electrical contractors.

The "Package"

Here's what homeowners get when they buy the "standard package":

1. A new, single-phase, 3-wire, service entrance cable service consisting of two No. 4 and one No. 6 conductors.
2. A 100-ampere capacity service cabinet with two 60-ampere, 2-pole, multiple connected, fused, pull-out switches (one for branch circuits, one for future range circuits); and six fuses for four 15-ampere circuits and two 20-ampere heavy duty appliance circuits.
3. A new standard water pipe system ground connection where necessary.

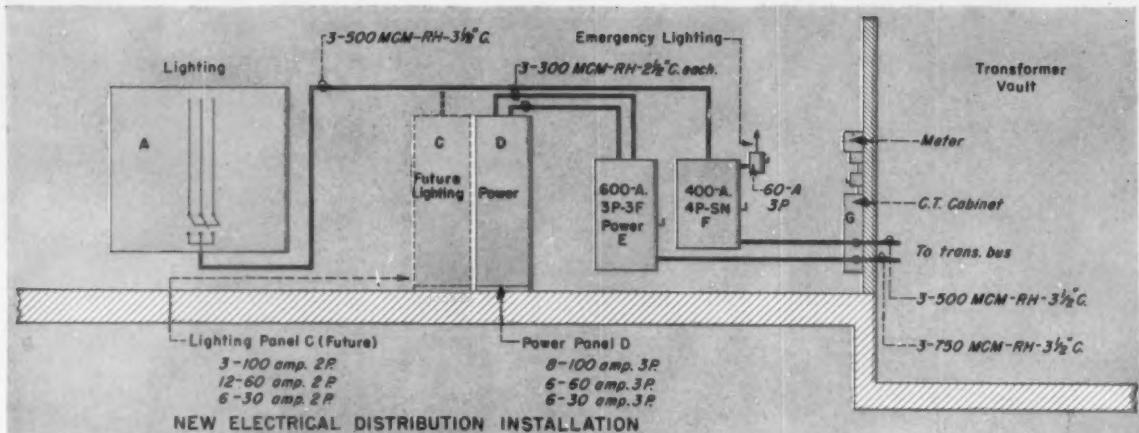
4. Re-installation of meter to outdoor location.

5. Re-connection of existing circuits to new cabinet facilities.

6. Installation of two new 20-ampere appliance circuits with a duplex receptacle in the kitchen and laundry or basement workshop. These circuits are either armored cable or conduit, depending upon structural conditions.

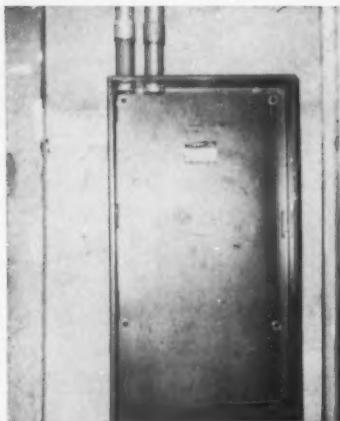
Homeowners are buying this standard package. And what is more encouraging is the fact that the average sale is considerably more than the standard package price. Many are buying additional circuit wiring or ranges and appliances they formerly could not use. Many are financing this through open-end mortgages or modernization loans.

The attendant photographs (taken on a Wigdahl project) typify the installations in older homes where low-capacity services with one or two-circuit, fused-neutral distribution facilities effectively strangled electrical use and convenience.



NEW ELECTRICAL SERVICE for Georgian Hotel, Athens, Ga., includes expanded capacity for single and 3-phase power, with installation of new cables for each, including main switches and distribution panels.

Hotel Outgrows Old Service—Rewires



NEW DISTRIBUTION PANEL will contain switches for power loads, be connected to existing power feeders.



OLD SWITCHBOARD used exposed knife-blade switches and fuses. Unit at left is elevator controller.

HOTELS in the South are finding it imperative to install air conditioning throughout, or lose business. Such was the case of the Georgian Hotel in Athens, Georgia.

But to install air conditioning in any hotel built more than ten years ago means that the old electrical system has to be revamped. Air conditioning more than doubles the electrical load for most of these old buildings. This means new and larger service entrances, larger switches and switchboards, new distribution panels, and new feeder and branch circuits to the air conditioning units.

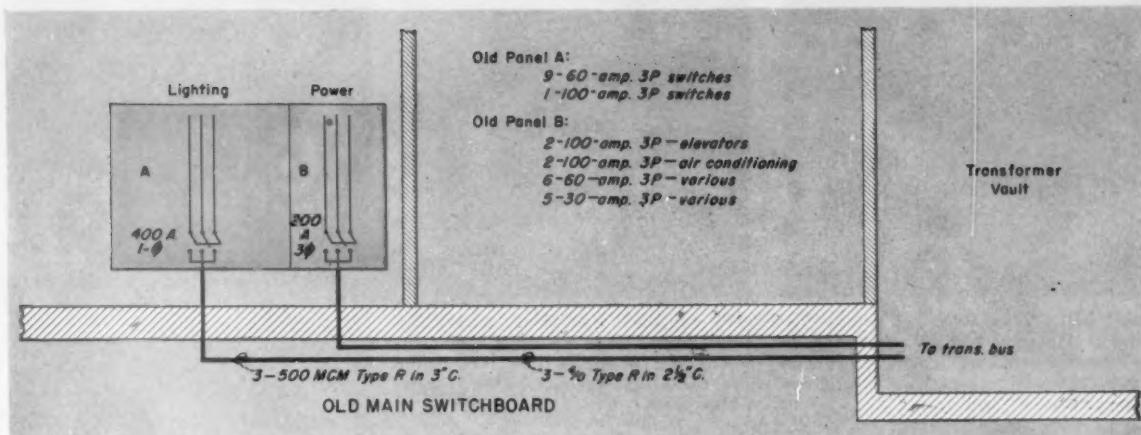
Such was the case at the Georgian Hotel. It was built in 1909, and wired at that time. The original wiring consisted of one 400-amp single phase main switch for lighting and miscellaneous circuits, and one 200-amp 3-phase 3-pole main switch for power loads. These were installed on an old open-type board with exposed knife-blade switches and fuses for mains and feeder circuits. This 1909 installation was serving a five-story and basement building containing 125 rooms, lobby, dining room, etc. The load demand for June 1953 was 106 kw, and served by the old original installation, at which time air conditioning was first seriously considered.

Roberts Electric & Appliance Co., Athens electrical contractors, surveyed the old existing electrical system, and came up with a recommendation for rewiring, and installation of new electrical service and distribution system with ample capacity to handle the new air conditioning load. As on most such installations, economy was a ma-

jor factor. Working with representatives of Georgia Power Company, Roberts Electric recommended the old electrical service be abandoned, and that new feeder mains, switches, and distribution panels with 1200-amp capacity be installed. This recommendation was adopted, with minor changes, as shown in the drawings.

Two old walls were removed, and a new wall was built to enlarge the size of the electrical equipment room. To serve the power load, including individual unit air conditioners for four floors (all except 5th floor), a 600-amp 3-pole fused main switch was installed, fed by three 750 MCM Type RH cables, providing 220-volt 3-phase service. To serve the lighting load and miscellaneous 110-volt service, a 400-amp 4-pole solid neutral main switch was installed in lieu of the 600-amp switch recommended. This switch is fed by three 500MCM Type RH cables, providing 110/220-volt single phase service. This main switch was selected so that it could be utilized on a future 120/208-volt 3-phase, 4-wire system which the power company is contemplating.

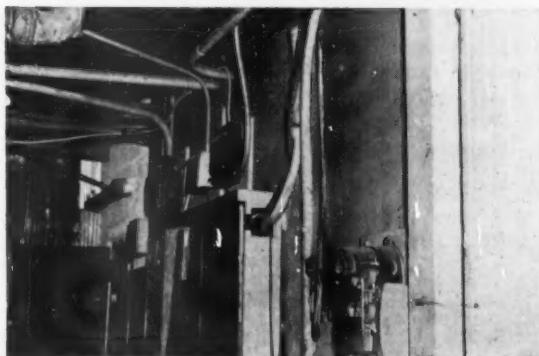
The two new service mains were run from the transformer vault in the building basement through conduit, a wire trough, and CT cabinet to the two main switches. One of these, switch F, controls all lighting and single phase loads. The other, switch E, controls all power or 3-phase loads. A new distribution panel containing 20 switches for power feeder circuits was installed to handle all power loads, and connected to the 600-amp main switch. All the old existing switches, installed



ORIGINAL SERVICE was installed in 1909, included two 3-conductor mains from transformer bus to old switchboard, which has served hotel until this time. This old service was abandoned as unsafe due to insulation deterioration.



NEW MAIN SWITCHES are 600-amp 3-pole 3-phase for power load (left), 400-amp 4-pole solid neutral single-phase for lighting and miscellaneous (center) and 60-amp 3-pole switch (upper right) for emergency lighting.



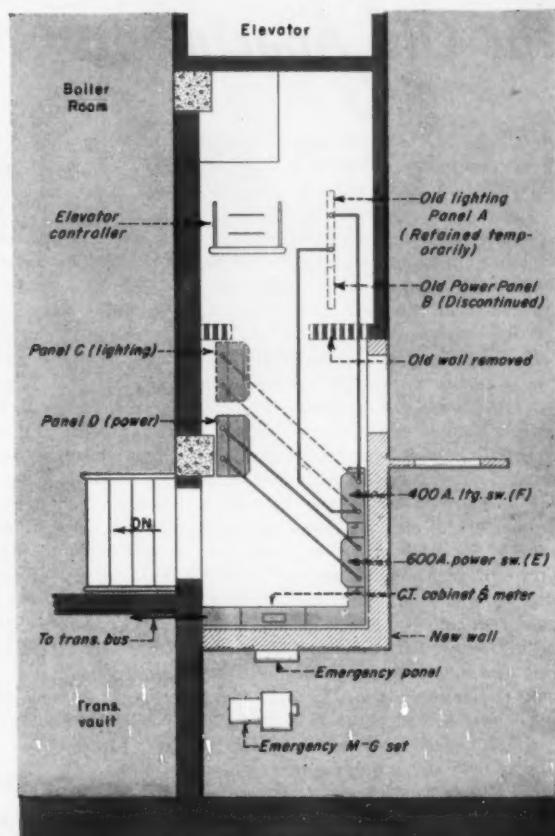
SWITCHES for power feeders were installed, one at a time over the years, on old switchboard and on wall outside electrical room, wherever space would permit.

on the old switchboard and in haphazard fashion in various locations around the basement walls, are being removed and feeders extended to the new distribution panel.

The new distribution panel recommended for the lighting and single-phase loads is not being installed at

this time, but will be installed eventually. Therefore all switches on the old switchboard lighting section are being connected to the new 400-amp main lighting switch.

This is another example of the electrical contractor working with the customer to obtain a safe but econom-



PLAN of electrical room in basement shows old switchboard and location of new service and equipment. A large fan exhausts hot air from transformer vault to street.

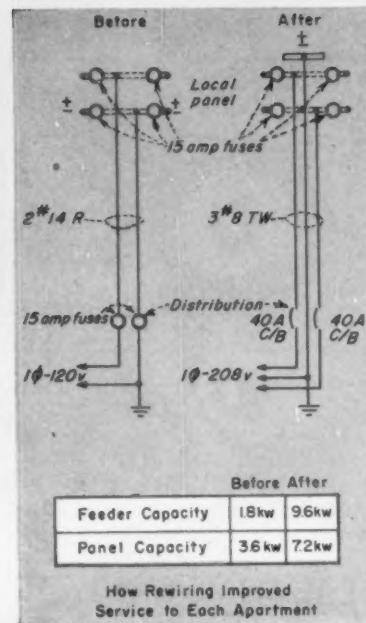
ical electrical system adequate for foreseeable electrical demands, including the current problem of expansion to permit installation of urgently-needed air conditioning. Included in future plans is air conditioning for the top floor of the hotel with a centrally located system for the entire floor.



GANGED METER TROUGHS and custom-made circuit breaker panels provide an efficient distribution system. Contractor Syme points to wireway riser feeding five apartments.



FIVE VERTICAL RISERS of No. 8-3c BX enter hinged-cover trough at basement ceiling. BX conductors are spliced to the TW wires which run back to meter distribution point.



New Risers for Old Apartments

INCREASING feeder capacities presents a special problem in the modernization of apartment buildings.

Long runs of inaccessible, undersize conduits will often preclude the use of existing risers for rewiring. Since the horizontal components are generally imbedded in the first floor slab and vertical risers are concealed behind lath and plaster, it is virtually impossible to modify the conduit system without a prohibitive amount of costly cutting and patching.

Installation of new conduits is also an expensive proposition. Laterals in the basement must be run through a latticework of existing plumbing, heating, and electrical pipes; moreover, they must be passed through thick bearing walls of concrete or brick. Vertical risers must be concealed in closets or in a wall. In this latter case, cutting and patching the plaster and lath may double the cost of this part of the job.

Since owners are generally unwilling to employ a consulting engineer to lay out the work, it becomes the bidders responsibility to devise a practicable means of increasing feeder capacities.

Seldom is the electrical contractor presented with an accurate plan of structural conditions on the existing wiring when asked to bid on apartment modernization systems. Thus, he must either guess the nature of the job on the basis of a superficial examination, or he may invest valuable time in a comprehensive survey of existing conditions, structural as well as electrical.

Faced with this problem, contractor Dave Syme of Flushing, N. Y. chose

the latter course. He reasoned that a bid based on guesswork might be worse than no bid at all; moreover, his examination of the existing layout might indicate an economical means of breaking the riser bottleneck.

Syme found each apartment in the 15-unit, 5-story building to be fed with two No. 14 wires. Each of the three conduit risers served five apartments. Conduit size decreased from 1 in. to $\frac{1}{2}$ in. to $\frac{1}{4}$ in. as the number of wires diminished. Further examination of the premises showed the flooring above the first floor to be laid on wooden beams or stringers.

Not content with this apparently sufficient data, Syme made an extensive survey of existing and contemplated loads in each apartment.

Having collected all this information, he made a precise layout of the job, after consulting various manufacturer's agents on how up-to-date equipment might help solve the problem. Syme was awarded the job.

New Riser System

The new installation called for three No. 8 wires to each apartment's existing fuse box. This would come to 15 wires in each home-run if existing conduits were used. It was therefore apparent that new feeders had to be installed.

Removing the baseboard just below the fuse box location gained access to the furred space behind the lath. The next step was to drill through the header below and drop a length of chain long enough to reach the fish point of the floor below. The concrete

slab of the basement ceiling was cut from beneath with an electric hammer. Five No. 8-3/c BX cables were pulled in at each of the riser points.

To avoid the necessity of running more than one raceway to each riser point, $2\frac{1}{2}$ -in. by $2\frac{1}{2}$ -in. wireway was utilized.

Where the trough runs along the ceiling, the cover is on the bottom. The additional labor of threading the wires into the trough was avoided by using hinged covers and snapping each cover shut as the wires were laid in.

One home run passed another riser point. Each run consisted of 15 wires and the Code permits 30 in a wireway, so it was possible to include both in the single duct.

Increased Circuit Capacity

The panels at the individual apartments consisted of a two-wire, four-circuit plug fuse cutout. Previously the neutral conductor had been fused, filling two circuits. This arrangement was discarded and one No. 8 wire was connected to each side of the cutout thus, in effect, doubling the circuit capacity of each dwelling unit. Neutrals were spliced solid.

Commitments were obtained from the occupants to the effect that any future air conditioner larger than $\frac{1}{2}$ ton would be operable at 208 volts. This was designed to minimize the possibility of unbalanced loads. Using this with the data he had gained in his survey of existing and contemplated loads, Syme arrived at a diversity factor which enabled him to use a 200-amp service with 3/o TW mains.

5

connections



END TO END



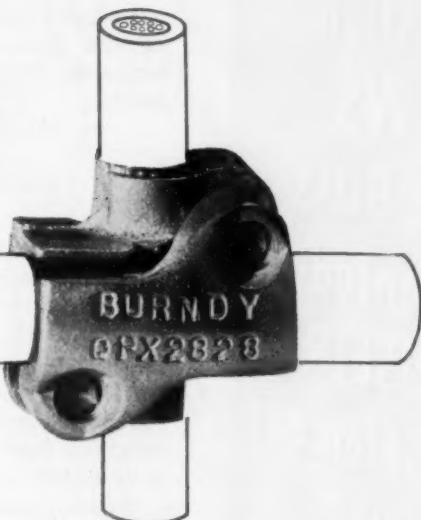
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S3-5

ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JULY, 1954

115

The
Biggest
Electrical
Protection
NEWS
Since BUSS
invented
the FUSETRON
Dual-Element
FUSE



FUSETRON is a trademark of the Bussmann Mfg. Co., Division of McGraw Electric Co.

Now! . . .

An INTERRUPTING RATING in EXCESS of 100,000 AMPERES for *every set of fuse clips in your plant . . .* simply by installing **FUSETRON dual-element FUSES**

In 1947 tests made by the Electrical Testing Laboratories of New York, showed that on a circuit set to deliver 50,000 amperes, FUSETRON fuses in all tests cleared the circuit safely.

50,000 amp. Interrupting Capacity in 1947 becomes

100,000 amp. Interrupting Capacity Today

After years of intensive development work on FUSETRON fuses new tests were conducted under conditions that simulated the most severe field conditions and these tests were witnessed and verified by the Electrical Testing Laboratories of New York.

On circuits set to deliver in excess of 100,000 amperes, 30 to 600 ampere, 250 and 600 volt FUSETRON dual-element Fuses on each and every test cleared the circuit without belching flame or venting hot gases and with comparatively little noise.

Oscillograms of these tests interpreted by the Electrical Testing Laboratories, showed that the total available amperes including the direct current component, reached values as great as 165,000 peak amperes on 240 volt tests and as high as 212,000 peak amperes on the 535 volt tests.

This indicates that an interrupting rating of 100,000 amperes for FUSETRON dual-element fuses is a conservative one.

No interference with time-lag

In the development work to increase interrupting capacity in FUSETRON fuses it was kept in mind that the time-current characteristic must be maintained. Time-lag is of utmost importance to give proper motor and electrical protection and to eliminate needless blowing of fuses.

Remarkable results have been achieved. Interrupting capacity has been greatly increased while the time-current characteristic of FUSETRON fuses has in no way been disturbed.

Play Safe - install Fusetron Fuses throughout the entire electrical system!

Think!...

**ALL THIS ADDED SAFETY
without changing a panelboard
or switch... plus 10 Point Protection
of FUSETRON dual-element FUSES!**

Maximum Safety

With FUSETRON Fuses there is no cascading of interrupting rating — no places where an excessive fault current might cause serious damage. Every FUSETRON fuse has an interrupting rating in excess of 100,000 amperes.

You don't have to worry about selecting chosen spots in which to pay extra for "safe" equipment. Wherever a FUSETRON fuse is installed you have safety as sure and dependable as you can buy — no matter what you pay.

No Maintenance Costs

When FUSETRON fuses have once been installed properly you can forget about them. They need no periodic inspections to see if they will operate safely.

Dust, fumes, corrosion or age cannot prevent a FUSETRON fuse from opening safely. There are no hinges, pivots or contacts to stick or slow down the operation of the fuse on short-circuit.

With FUSETRON fuses — you get safety — without one cent spent for inspection or maintenance costs.

No Recalibration Costs

When a FUSETRON fuse does blow, there is no recalibration needed. As quickly as the fault in the circuit is corrected, you slip in a new fuse that has been CALIBRATED AT THE FACTORY BY ENGINEERS — a fuse that is as safe and dependable as the one that blew.

**for SAFE PROTECTION on loads
above 600 and up to 5000 Ampere
install BUSS Hi-Cap FUSES**

Tests have shown that BUSS Hi-Cap fuses have unlimited interrupting capacity on circuits of 600 volts or less.

They are designed to give protection against dangerous overloads as well as high fault currents — yet their speed of operation on heavy shorts limits currents to safe values. This minimizes damage to equipment and cuts down dangerous stresses on transformers.

When coordinated properly with FUSETRON dual-element fuses they will not open ahead of the fuses nearest to the fault. Thus trouble is isolated to the part of the circuit in which the fault occurs.

Added SAFETY on Old Installations

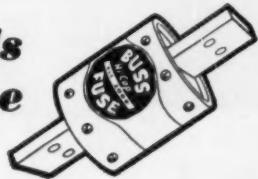
On installations where the increase in the capacity of the circuit has outgrown the interrupting rating of the circuit breakers, BUSS Hi-Cap fuses offer a safe and relatively inexpensive way to protect inadequate breakers against rupture in event of a bad fault.

Bussmann Mfg. Co., University at Jefferson, St. Louis 7, Mo. Division McGraw Electric Company



PLUS 10 POINT Protection with FUSETRON dual-element FUSES

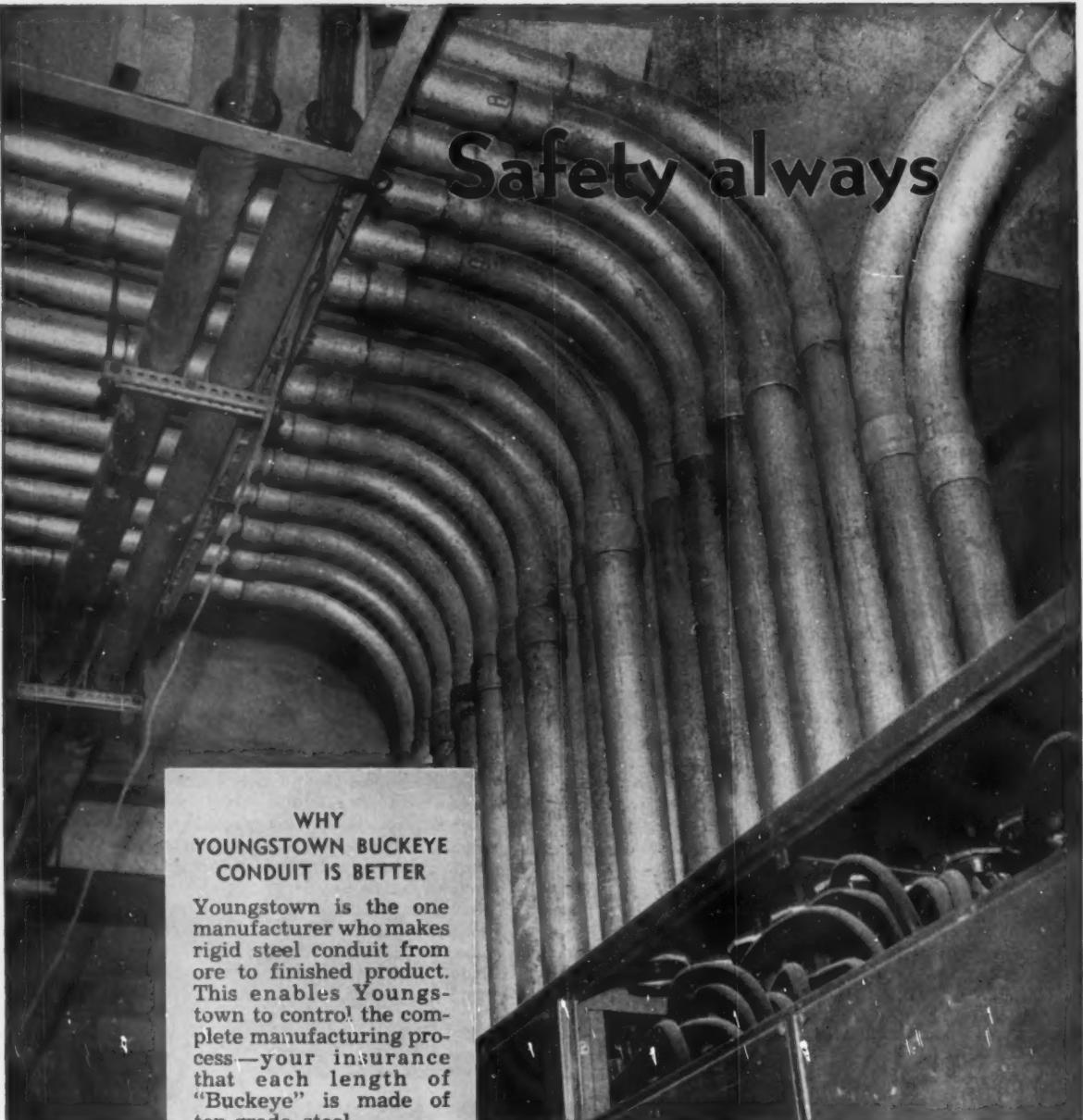
- 1 Protect against short-circuits.
- 2 Protect against needless blows caused by harmless overloads.
- 3 Protect against needless blows caused by excessive heating — lesser resistance results in cooler operation.
- 4 Provide thermal protection — for panels and switches against damage from heating due to poor contact.
- 5 Protect motors against burnout from overloading.
- 6 Protect motors against burnout due to single phasing.
- 7 Give DOUBLE burnout protection to large motors — without extra cost.
- 8 Make protection of small motors simple and inexpensive.
- 9 Protect against waste of space and money — permit use of proper size switches and panels.
- 10 Protect coils, transformers and solenoids against burnout.



ACTION THAT SAVES YOU MONEY

By passing the word along that all purchase and stock records should call for FUSETRON fuses on loads up to 600 amps—and BUSS Hi-Cap fuses on loads above that — you get action that begets money saving.

For blowing time charts or more information on FUSETRON Fuses and BUSS Hi-Cap Fuses write for Bulletins FIS and HCS.



Safety always

WHY YOUNGSTOWN BUCKEYE CONDUIT IS BETTER

Youngstown is the one manufacturer who makes rigid steel conduit from ore to finished product. This enables Youngstown to control the complete manufacturing process—your insurance that each length of "Buckeye" is made of top-grade steel.

Youngstown



THE YOUNGSTOWN SHEET AND TUBE COMPANY

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

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AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE -
HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

Manufacturers of
Carbon, Alloy and Tool Steel

- Rigid steel conduit is the only wiring system approved by The National Electrical Code as moisture-, vapor-, dust- and explosion-proof in hazardous locations. When you install Youngstown Buckeye you can be sure that you meet ALL safety requirements for today as well as tomorrow.

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ELECTRICAL CONSTRUCTION & MAINTENANCE • JULY, 1954

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Now...

ANDERSON

High Tensile Bronze

DURA-LUGS*

IN A WIDER RANGE OF SIZES
and capacities

ANDERSON DURA-LUGS* are specifically designed to meet the demands for power connectors with current-carrying capacities *equal to that of each conductor used*. Joint resistance has been reduced to practically the vanishing point . . . and, their sturdier, more compact, simpler construction all combine to assure positive pressure and take full advantage of the current-carrying capacity of every strand in the cables. Check these 4 points of superiority:

DURA-LUG* design combines high tensile bronze for clamping members and high conductivity metal contact surfaces for greater current carrying characteristics.

This means:

- A Minimum elongation in the cable opening to maintain clamping pressure.
- B Withstands A.S.T.M. Mercurous Nitrate Test.
- C Develops maximum "pull out."

They require no special tools to install.

Lockwasher provided to prevent loosening under vibration.

11 sizes provide the *right* capacity for each size of cable used.

Underwriters' approval on all catalog sizes to I T E 050A
* Patent Applied For

FOR COMPLETE INFORMATION, CONSULT ONE OF OUR NEAREST
20 REPRESENTATIVES . . . OR CONTACT OUR MAIN OFFICE.

POWER CONNECTORS • CLAMPS • FITTINGS • ACCESSORIES
• TRANSMISSION • DISTRIBUTION



ANDERSON BRASS WORKS, Inc.
P. O. DRAWER 2151 • BIRMINGHAM 1, ALABAMA

*the answer to
increased residential
electric service demands*



NEW FA SPLIT-BUS circuit breaker type SERVICE EQUIPMENT

Install these new **⑩** "Enclosed Panel Base Assembly" type units in all residential buildings, both new and those being modernized.

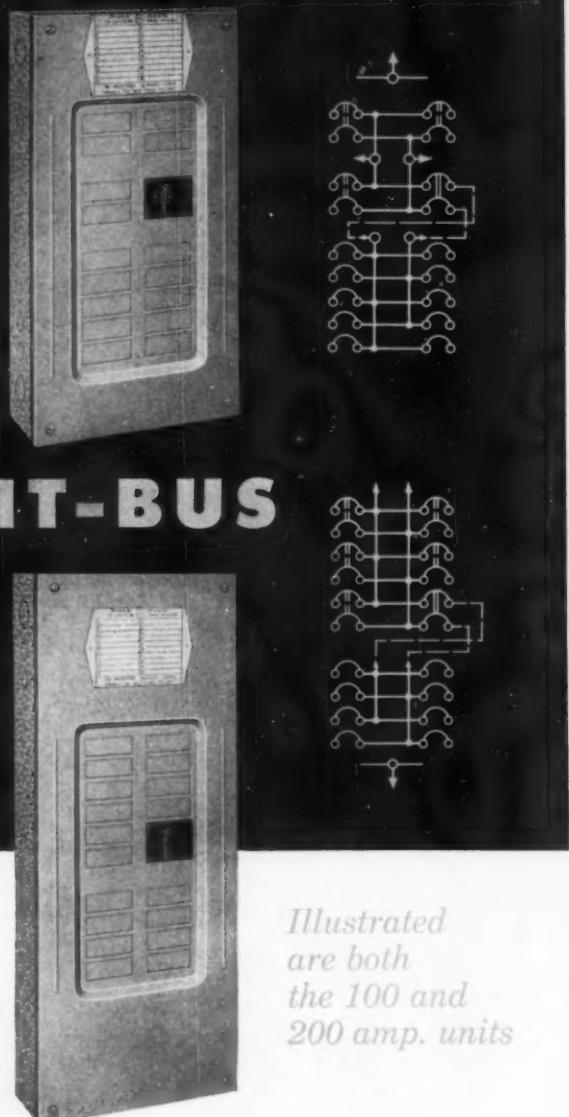
Approved by the Underwriters' Laboratories, Inc., for label service, these units effectively solve the problem of expanding residential power demands.

They provide capacity for electric ranges, water heaters, dryers, air conditioning, etc., and sub-feeder circuit to an additional center of distribution.

The new units have 100 or 200 amp. feeder capacity for single phase, solid neutral service. Each is furnished with one service connection having a double pole 50 amp. circuit breaker with wire connection to the lighting and appliance branch circuit section.

Another big feature is that the units, together with a stock of individually-packaged **⑩** T-M and QP Thermal-Magnetic Circuit Breakers are available from **⑩** distributor's stocks for quick and easy assembly on the job. So be sure to include these units in all future residential type of construction.

For further information, contact your nearest **⑩** distributor or **⑩** representative listed in Sweet's Architectural and Builder file.



*Illustrated
are both
the 100 and
200 amp. units*

SPECIFIC DATA ON SPLIT-BUS SERVICE EQUIPMENT

Catalog No.	Amp. main capacity 3-wire single phase	Max. No. Branches		Size
		DP	SP	
⑩SE4DPL100-10SPL50	100	3	10	9"x18"x3½"
⑩SE60PL200-8SPL50	200	5	8	9"x24"x3½"

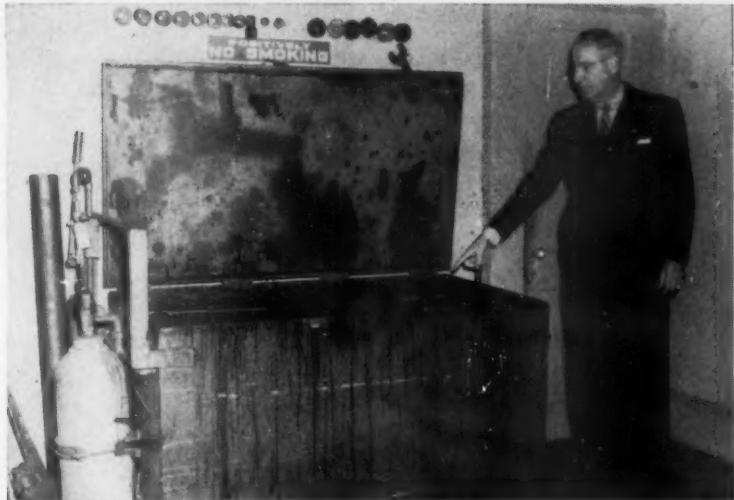
All circuit breakers are thermal-magnetic, quick make and quick break. Capacities, 10 to 30 amps. are **⑩** T-M and 40 and 50 amps. are **⑩** QP. Adjoining single pole branches can be fitted with handle extensions for double pole individual trip operation.

Frank Adam Electric Co.

BOX 357, MAIN P. O. • ST. LOUIS, MO.

*Makers of: busduct • panelboards •
switchboards • service equipment •
safety switches • load centers • Quikheter*

Motor Shops



Fire Precaution For Dip Tank

Precautions against fire in the motor repair shop of W. M. Hendrickson and Co., Philadelphia, Pa., include an automatic fire extinguishing arrangement on the varnish dip tank. The equipment is such that if a fire should break out in the dip tank, a spray of carbon dioxide will be released into the tank.

The tank in this case is 6 ft. by 3 ft. by 3 ft., constructed of sheet steel, with casters on its base making it portable. A 50-pound carbon dioxide (CO_2) container is mounted on one end of the dip tank. Four tubes lead from the CO_2 container into the tank. In the event of fire, a fuse link in the tank automatically releases the CO_2 from the pipes, smothering the flame.

As an added precautionary measure, a handle releases the tank cover which is held upright while dipping is in process. In tests made, flames have been put out in a matter of seconds. This safety feature on the dip tank has also lowered insurance costs.

Dental Chair Used In Paint Booth

Small motors, prior to being shipped out from the shop of Queens Electric Motors, New York, receive a finishing coat of paint in a compact idea-cramped booth where vaporproof lighting, sprinkler heads, a high-capacity

city exhaust system and baffle plates all contribute to the usefulness and safety of the area. For a painting pedestal, the base of a dental chair serves admirably, with a sheet steel bedplate replacing the actual chair. Since the chair base may be easily raised or lowered, or swung around to any desired angle, the worker can regulate the painting platform to suit his convenience and can revolve the motor so as to reach all parts with a thorough coating of sprayed paint.



GUN-TYPE SPRAYER applies paint to motor supported by pedestal of discarded dental chair fitted with metal base-plate platform. Spray booth is also equipped with baffles, vaporproof lighting, sprinklers and exhaust system.

(These chair bases are also used in the winding department.)

Paint is applied with a standard compressed-air gun-type sprayer, the paint being contained in metal jars that can be substituted quickly, thereby making the selection of a particular color an easy matter. These various jars of paint are kept capped, and they are conveniently stored in a rack fastened to the side of the spray booth. An extra jar is filled with thinner and, since the spray gun is connected to this jar after each spraying session, the gun mechanism and tip is kept clean and in a non-clogging condition. Air compression is instituted with a foot pedal that activates the compressor motor, and the actual release of a paint spray is by the action of a trigger on the painting gun.

Insulation Cutting Table Has Drawer to Catch Pieces

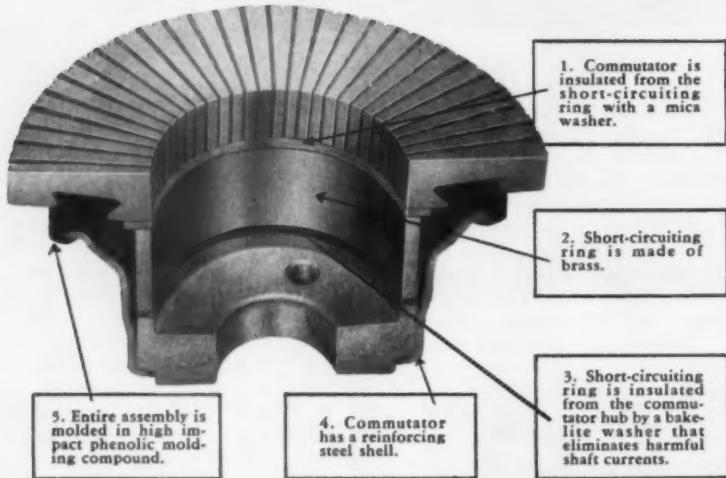
Safety to personnel and operating efficiency are by-words in the motor repair shop of Dudley Electric Company, Flint, Michigan. Whenever possible, Dudley mechanics add devices to shop equipment to attain this goal.

The insulation cutting table in the Dudley shop is a typical example. Instead of picking up short pieces of slot insulation from under the cutting board blade, Dudley mechanics built a 9½-in. by 22½-in. by 1½-in. drawer in the cutting table to catch the insulation. An opening in the table top immediately above the drawer permits cut insulation to fall into the drawer. When the desired amount has been cut, the mechanic merely pulls out the drawer and picks up the pieces.

A standard 25-in. by 25-in. cutting board is mounted to two lengths of 2 by 4's which rest on the table and extend slightly over one edge. A slanting "shelf" added to the overhang holds long strip insulation when it is cut. An adjustable "stop bar" with guide blocks rides on top of the 2 by 4's, having a 14-in. horizontal adjustment range for cutting insulation to desired widths. The bar can be moved to the left or right by merely loosening a wing nut on the positioning bolt. Tightening the nut locks the bar into place. A wood crosspiece on the bolt head rides along the bottom of two wood "rails" on the inside of the 2 by

GENUINE JOE SAYS:

Here are
5 good reasons
why
Wagner
Commutators
last longer



Genuine Wagner Commutators are designed to withstand great centrifugal force. They're built with care to provide the extra strength needed for long life.

P.S. they're safe to reface too!

P.P.S. Be sure to get the NEW Electrical Service Catalog MU-40

It's just off the press. Every repair shop needs this valuable help. It's yours for the asking.



WAGNER ELECTRIC CORPORATION
6413 Plymouth Ave., St. Louis 14, Mo., U.S.A.

MOTORS - BEARINGS - STANDARD ROTORS
BRUSHES - CAPACITORS - COMMUTATORS

OVER 750 AUTHORIZED SERVICE STATIONS
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MS34-4



INSULATION CUTTING board at Dudley Electric Company is mounted on 2 by 4 base with adjustable stop bar and slanting rack on end to hold long strips.



SHORT PIECES DROP into drawer built into cutting table, do not accumulate under cutting blade. Stop bar to right of blade has 14-inch horizontal adjustment.



DRAWER PULLS OUT so mechanic can retrieve batch of cut insulation. Pieces drop down from blade through opening cut in table.

4's. A squeezing pressure on the stop bar and crosspiece is applied when the wing nut is tightened and the bar cannot move.

Men in the Dudley shop report this device has definite safety merits and substantially speeds up the insulation cutting operation.



FIRE SAFETY is our business, too!

Dependable CLARK Fire Pump Motor Starters are on guard in thousands of buildings to help prevent disaster like that above. We have been in this business for nearly half a century and have been pioneers in the field.

CLARK Fire Pump Controls are available in non-automatic and combined automatic—non-auto-

matic types. They are approved by Underwriters' Laboratories, Factory Mutual Association and conform to National Fire Protection Association standards. Because of this approval, CLARK Fire Pump Controllers on your systems earn the lowest possible insurance rates.

Engineering service and descriptive literature is available.

The **CLARK**
ENGINEERED ELECTRICAL CONTROL

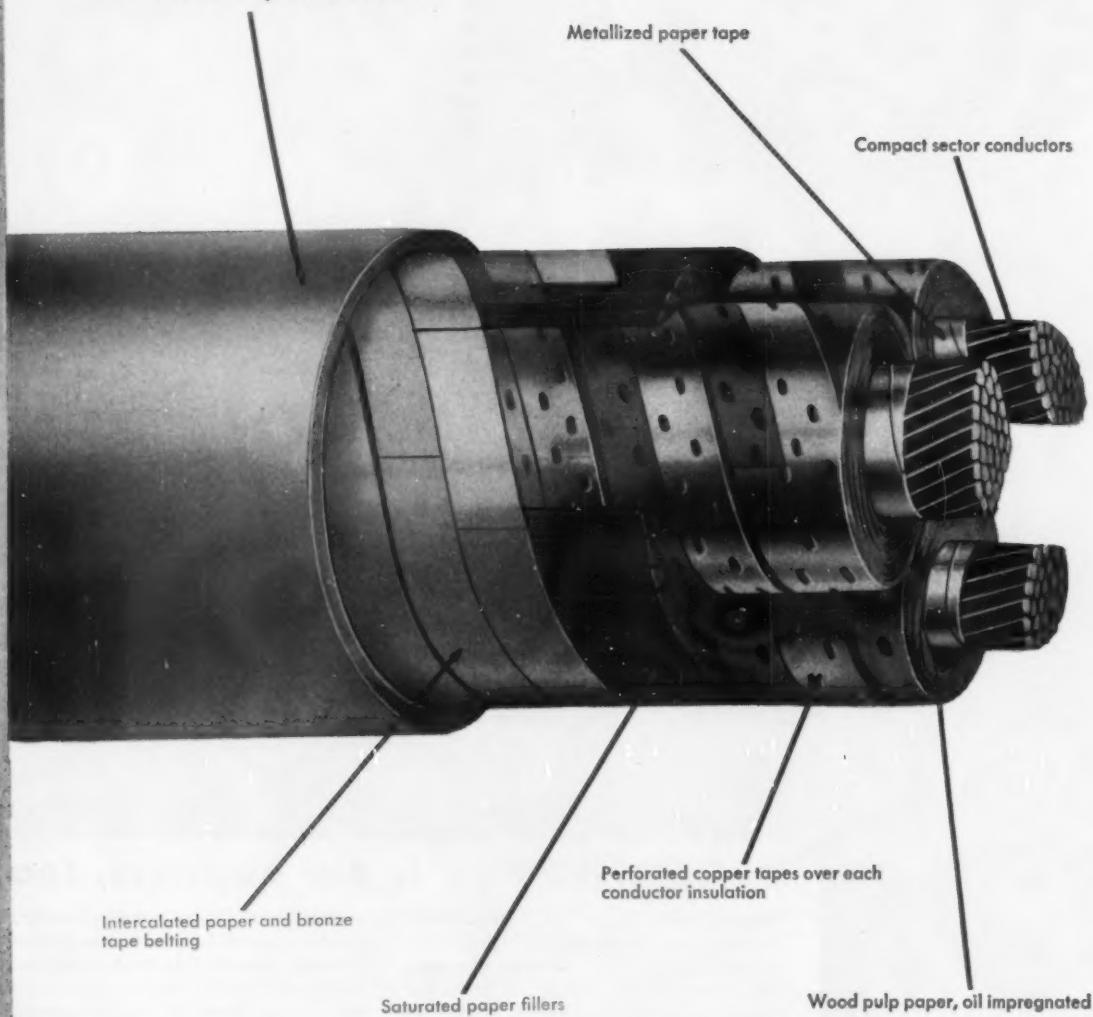


CONTROLLER Co.

1146 EAST 152nd STREET, CLEVELAND 10, OHIO

NEW TELLURIUM ALLOY LEAD SHEATH IT'S A ROEBLING

Tellurium Alloy Lead Sheath



BRINGS 4 BIG ADVANTAGES AND EXCLUSIVE!

ROEBLING IS NOW READY to fulfill your requirements for Paper Insulated Power Cable with the new Tellurium Alloy Lead Sheath... the perfect and economical answer to four serious power cable problems.

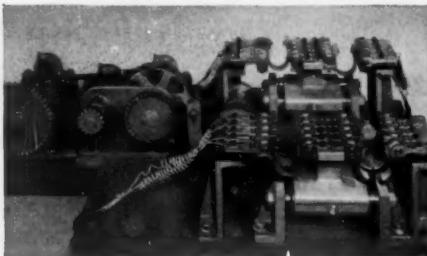
Tellurium Alloy Lead Sheathed Paper Insulated Cable has a lower long-time creep rate. It has extra high fatigue resistance. This cable has high bursting strength. It has remarkable stability under heat application as in duct splicing and wiping.

In addition, it does away with the need for frequent and expensive segregating stop joints or costly reinforced lead sheaths... does not require extra-liberal

expansion bends or large manholes... its bursting strength is far superior to that of any other cable sheath alloy... heat application at joint end wipes and similar locations leaves its desirable properties unimpaired.

Roebling Paper Insulated Cable with Tellurium Alloy Lead Sheath is now in full production. Practical experience has confirmed laboratory findings that this new sheath brings a combination of physical characteristics that assures new measures of performance and unmatched economy.

WRITE US FOR FULL DATA. John A. Roebling's Sons Corporation, Dept. 707, Trenton 2, N. J.



Some of the specially-developed testing equipment with which Roebling maintains quality control of the production of Tellurium Alloy Lead Sheath. (At left) Lead strip fatigue testing at controlled temperature. (At right) Lead strip fatigue testing at room temperature.



ROEBLING

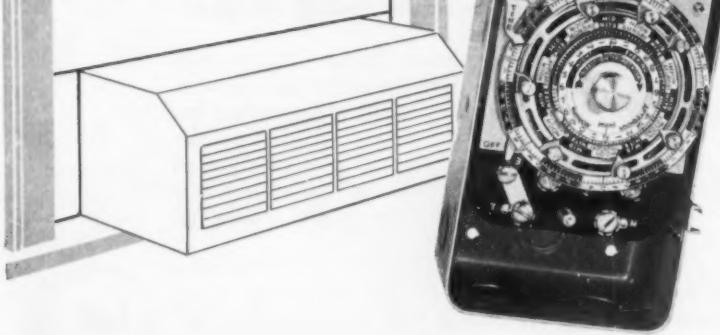


Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. & 5 PITTSBURGH ST. • CHICAGO, 5525 W. RODEEVELT RD. • CINCINNATI, 3353 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, ROOM 239, HENRY W. OLIVER BLDG. • ROCHESTER, 1 FLINT ST. • ST. LOUIS, 2001 DELMAR BLVD. • SALT LAKE CITY, 526 W. 8TH SOUTH ST. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, TRENTON 2, N. J.

Announcing PARAGON'S NEW 3700 SERIES WINDOW AIR CONDITIONER SWITCH

A PROFITABLE
SALES CLINCHER



Gives your customers convenience of regular daily settings and irregular weekly operation — including Sunday and holiday cutouts



EASY TO SET

Inner dial set for ON operation any hour. Once set, the same setting prevails each day without resetting. Dial adjustable in 15-minute increments.

Dial trippers on outer dial may be varied to shut OFF unit at a different hour each day or set to eliminate Sunday and holidays.

THE Paragon 3700 Series switch can be set to "get to the office early" and turn ON window air conditioners before business... "stays late" to turn them OFF after closing hours.

The complete convenience and flexibility of the 3700 Series timer ends unnecessary air-conditioner operation . . . saves money week-ends and holidays. Switch may be manually operated at any time without disturbing sequence of automatic operation. A profitable sales clincher for any window air conditioner to 1-ton capacity. Write for Bulletin 5470, Dept. 1614.

Also write for complete facts on these famous Paragon timers

Commercial Defroster.



Dehumidifier Timer



7-Day Calendar Dial Time Switch



Fan Timers



PARAGON ELECTRIC COMPANY
TWO RIVERS, WISCONSIN

WORLD'S FOREMOST MANUFACTURER OF TIME CONTROLS



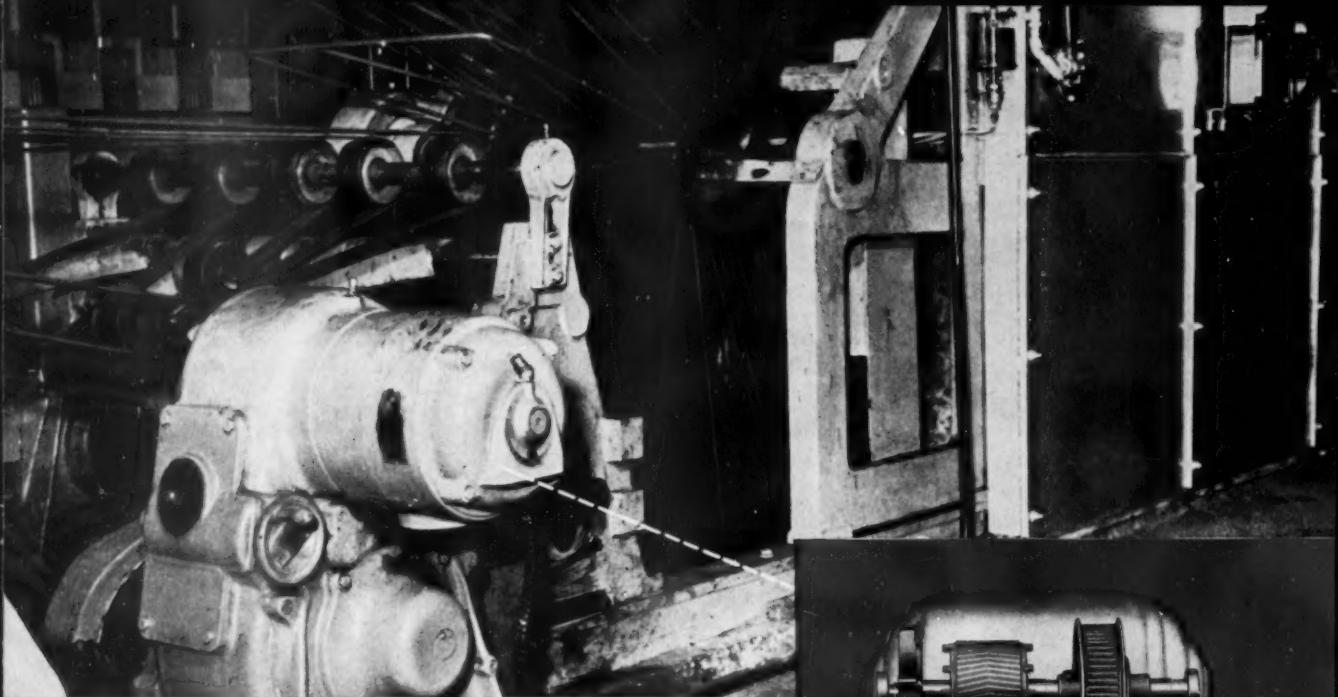
Wire Spools Racked On Wooden Columns

Two 2-by-6-inch wooden planks, notched every 18 inches to receive 1-inch steel bars, are bolted together to form the two-fold purpose of serving as an extra structural column and acting as a large-capacity rack for spools of small-diameter wire in the shop of Queens Electric Motors, New York. Collars fitted with set screw are placed at the ends of each of the horizontal steel bars, preventing the spools from slipping off the arms. Since the coil winding machines are positioned in line with these columns, the wire spools need not be removed from their storage location, so handling becomes unnecessary except to replace depleted spools.

As indicated by the illustration, each arm holds up to three standard spools on each side of the column, thereby providing space for several dozen reels at each location. The larger and heavier reels, of course, are located at the bottom, lessening the bending moment placed on the column and also reducing the labor required to replace it when necessary.

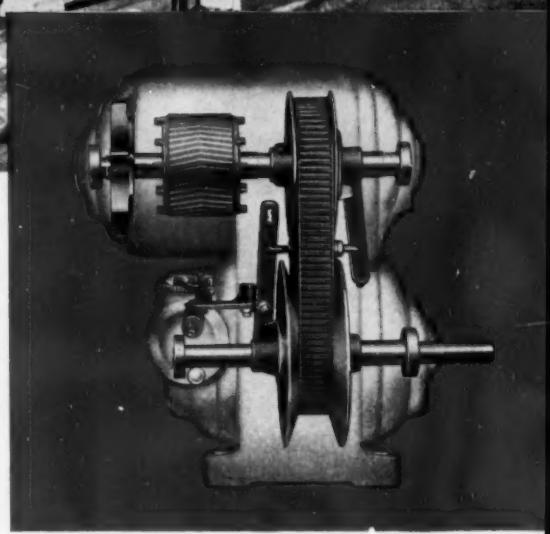
Routing Slip Cuts Delivery Mileage

Harcos Equipment Company of Washington, D. C., delivers dozens of motors each day to customers in that area and, in order to eliminate surplus trucking distances, retraced routes and the associated wasted time of the driver, President Lee Harris dreamed up a simple delivery sheet that serves several purposes. Headed by spaces for the date, sheet number and driver's name, the form is divided into four vertical columns. Of these, the first



NO MAINTENANCE COSTS REPORTED IN 5 YEARS ON

The Speed-Trol on a 90-foot Wagner Lithograph Drying Oven provides the infinite speed adjustment and positive control of speed required for accurate regulation of drying time. This drive, in operation 16 hours per day, five days per week, since 1947, has given trouble-free service, and a recent inspection discloses no worn parts, reports E. E. Roney, Plant Manager, Bond Crown & Cork Co., New Orleans.



Speed-Trol...Variable Speed at its Best

OUTSTANDING FEATURES:

A Single, Compact Power Unit containing motor, variable speed transmission, with or without integral speed reducer—**Effective Cooling Systems** with direct-through ventilation, dual or internal cooling—**Positive Pulley Adjustment** for infinite speed variation, accurate speed selection and regulation—**Fingertip Control of Speed** with standard or remote controls—**Specially Designed V-Belt** for heavy duty, long life—**Protected Designs**, drip-proof, splash-proof,

totally enclosed—**Rugged Construction** for continuous duty, permanent bearing alignment—**Streamlined** for easy cleaning, better appearance—**Interchangeable Mounting Dimensions** between constant and variable speed drives—**Versatile Mounting** for any position—**Smooth, Quiet Operation** through dynamic balancing; Herringbone Rotor; pre-lubricated, double shielded ball bearings—**Low Installation Cost** due to compact design, versatile mounting, interchangeable mounting dimensions.



20-PAGE ILLUSTRATED CATALOG
...Sterling Speed-Trol, Slo-Speed, Klosd and Klosd-Tite Electric Power Drives. Write for catalog No. G-416

There is a Sterling Electric Power Drive to Meet Virtually Every Requirement

Sterling Slo-Speed Electric Power Drives—for geared low speed at its best
Sterling Klosd and Klosd-Tite Motors—for constant normal speed at its best

STERLING

ELECTRIC
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Plants: New York City 51 • Chicago 35 • Los Angeles 22 • Hamilton, Canada • Santiago, Chile

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**COMPLETE LINE OF
QUALITY FLUORESCENT
AND
SLIMLINE FIXTURES
FOR EVERY REQUIREMENT...
COMMERCIAL & INDUSTRIAL**

BY

WILEY

Pioneers in Fluorescence
Since its Inception

- Modern, functional designs to harmonize with any architectural motif.

- Stock fixtures adaptable for all lighting layouts.

- Units designed for quick, easy erection. A minimum of "on-the-job" assembly.

- Patented E-Z Servicer.

- District Sales Engineers available for prompt cooperation.

Designed and completely manufactured by WILEY, with ETL Certified Electrical Components.

For Full Information, write

R&W WILEY, INC.

Dearborn at Bridge St.,
Buffalo 7, N.Y.

Underwriters' Approved
IBEW (A.F.L.) Label
Fleur-O-Lier Certified Models

column lists the address of the customer, the second gives the invoice number or numbers of the motors being delivered, the third column is checked if the delivery is on a C.O.D. basis, and the final column lists the name of the customer. This last column also has space for a signature, so that, when a motor is delivered and signed for, the delivery sheet constitutes a receipt as well.

As motors are scheduled for delivery, they are placed in various groups, corresponding to approximate sections of the city. Then, as these motors are loaded on the truck, the delivery sheet is filled out as indicated. With the addresses at the left of the sheet, it is then a simple matter to glance over the list, jot down a logical route, and make the deliveries in a single swing through the district in question. At the end of each day's deliveries, the sheets are filed as receipts.

Heavy Duty Armature Stand

Special heavy duty stands for working on large armatures have been constructed by the Somerset Electrical Co., Inc., Philadelphia. Designed to support over four tons and to handle better than 400-hp armatures, these stands have added speed and efficiency to many operations on large equipment.

As shown in the photo, there are two separately constructed sections to each stand. Each section has a base which consists of two lengths of 6-inch, shallow-U channel iron. A plate of 3/16-in. sheet steel, measuring 4 feet across the base of its roughly triangular

shape and 14 inches across the top, straddles and is welded in upright position to the channel iron lengths. Along both sloping sides of the sheet steel upright, sheet steel flanges are welded to add strength and rigidity.

Between two sheet steel cross-pieces at the top of the upright piece, two 5-inch rollers are mounted. These rollers form a cradle for an armature shaft and permit easy rotation of an armature.

As shown, the two sections which make up a stand can be positioned according to the length of the armature. For easy transporting of the stand sections in the shop, a large hole is cut through each section, near the top of the upright piece. A hoist hook is simply engaged in the hole and section raised and moved to any location.



Rounded Bottom On Mobile Dip Tank

A mobile varnish dip tank with a rounded bottom is a factor behind fast and efficient operations in the motor shop of the Somerset Electrical Co., Inc., Philadelphia, Pa.

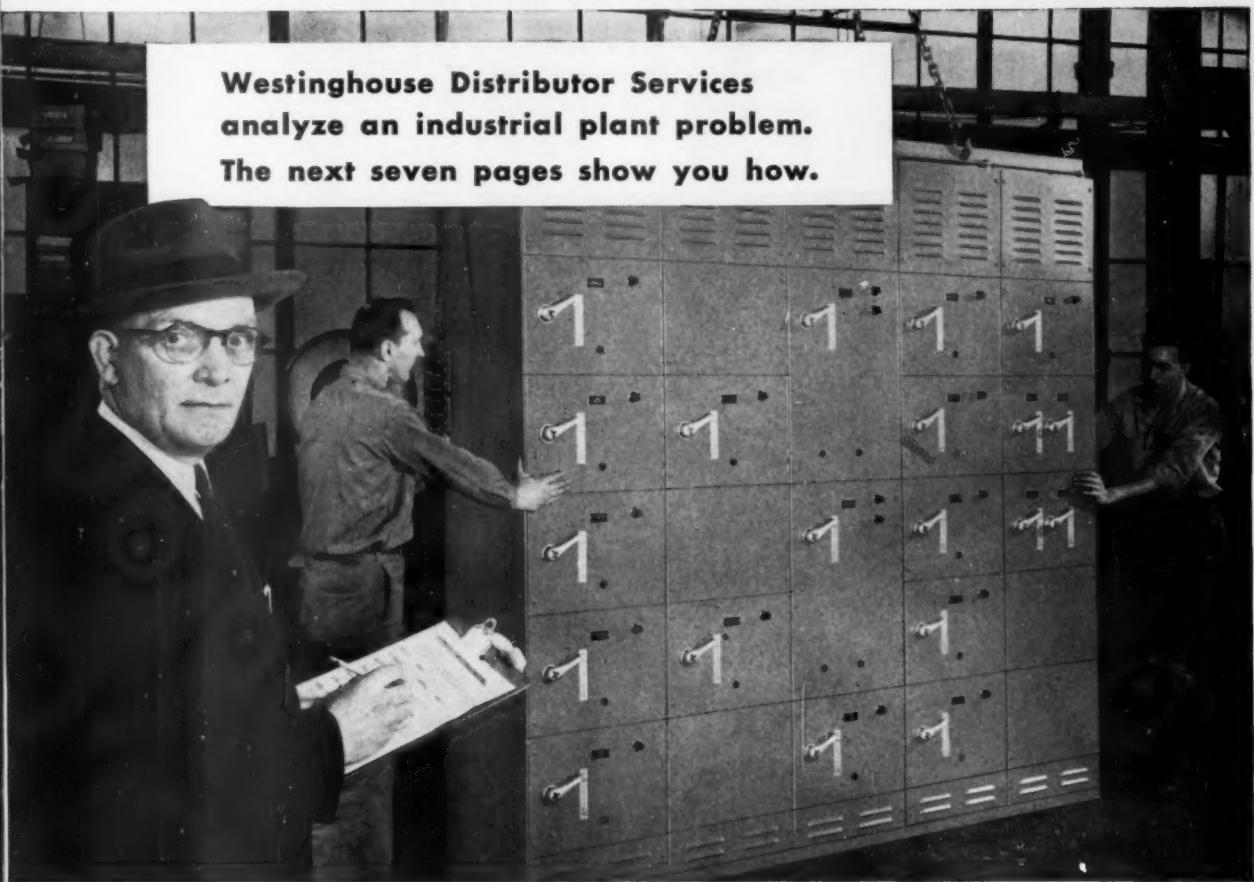
As shown in the photo, the dip tank measures 24 inches by 36 inches through its cross section and is 42 inches high. It is constructed of $\frac{1}{8}$ -inch sheet steel and welded at seams. The bottom is rounded as shown. The base and caster assembly on which the tank is cradled is welded to the tank.

This tank can be quickly and easily moved to any location in the shop, adding much to the flexibility of operations. Absence of corners in the bottom of the tank actually saves several gallons of varnish; enables full use of all space within tank; improves the quality of varnish dipping operations.



ARMATURE STAND for handling large, heavy armatures is constructed of sheet steel and channel iron; has rollers at top for easy rotation of the work.

**Westinghouse Distributor Services
analyze an industrial plant problem.
The next seven pages show you how.**



When management says: "Cut operating costs"... here's how we can help you

When management tosses this problem in your lap, the sum total of many factors must be determined. And more than a review of the electrical system is involved.

To really lower operating costs calls for an overall analysis—the relationship of power to many other plant areas. In scope, this can run from a review of production methods and machines to a detailed check of maintenance costs and down time.

That's where we, your Westinghouse Distributors, can help. Backed by the Westinghouse engineering and service staff, we offer you an "all-through" plan. From problem analysis through system design and equipment, installation and operational proof, we work closely with you to bring about cost-cutting practices.

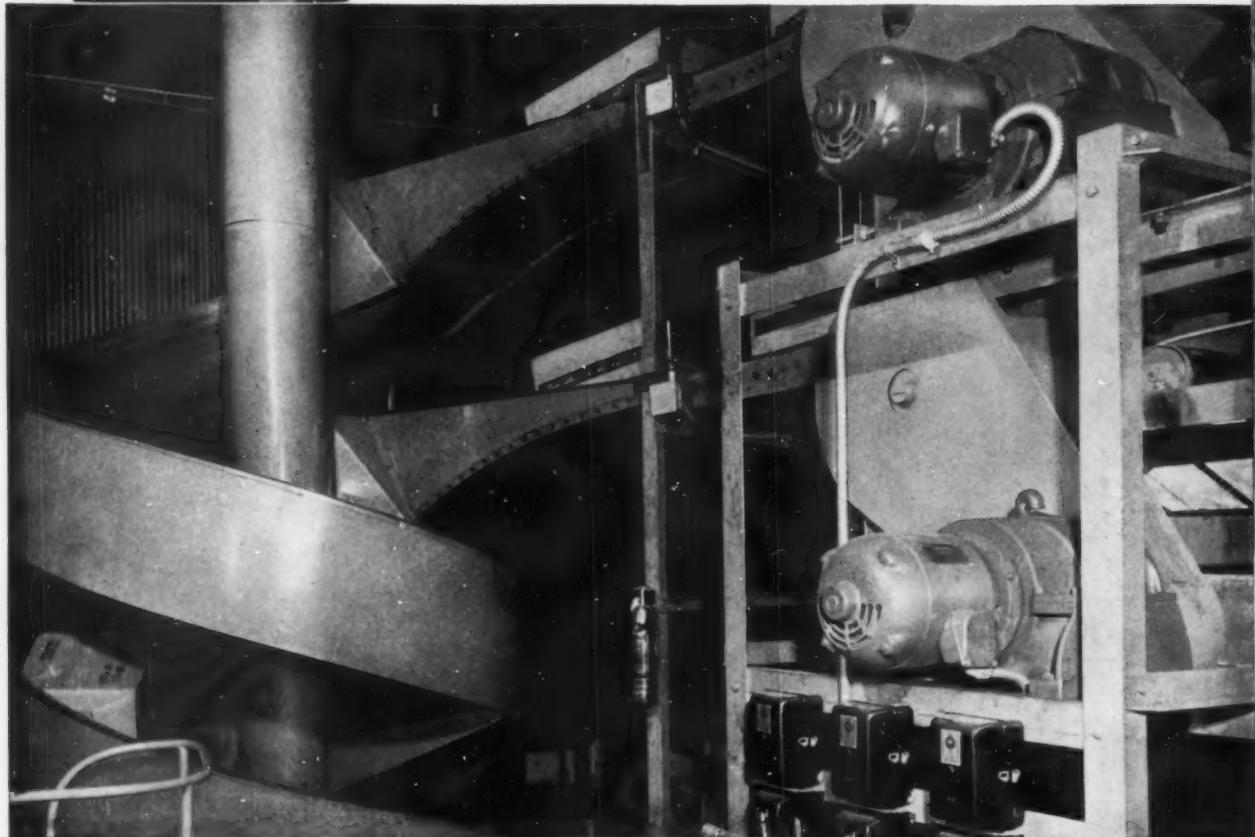
Specific examples of how we can do this are shown on the next pages. DP-5001-A

**you can be SURE...IF IT'S
Westinghouse**





"Look first at the drives behind production equipment . . . here's where costs can be cut."



Motor operating costs down 51.5% after Life-Line® Motor installation

In terms of dollars per year—per 100 motors—a plant survey showed that Westinghouse Life-Line Motors result in a \$693.58 operational savings over conventional a-c types.

Yearly outage rate for the conventional motors was \$1,348.62. On the 100 Life-Lines, it totaled \$655.04. That's a 51.5% slash in motor operating costs.

This performance record is due to the greatly improved design and structural materials. In addition, Westinghouse Life-Line Motors require no lubrication. They are equipped at the factory with

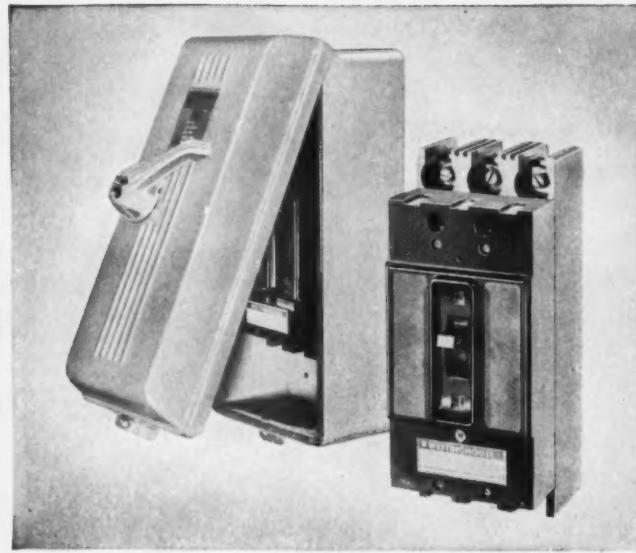
pre-lubricated bearings—sealed with a lubricant that inhibits oxidation or deterioration.

Once a Life-Line Motor is installed, the plant can forget about periodic greasing. And the motors can be mounted out of the way.

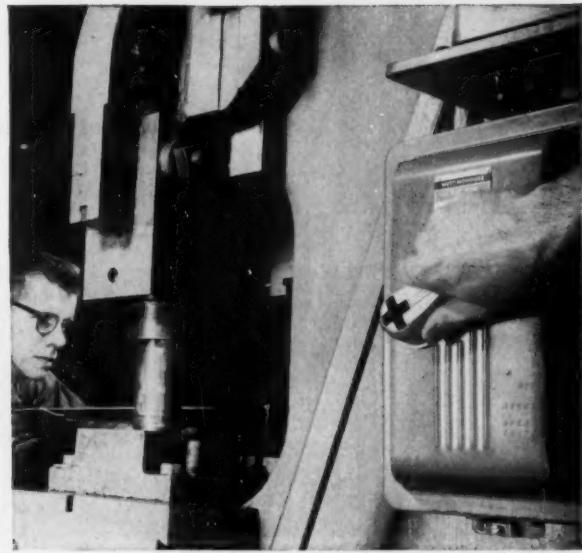
Westinghouse Distributors—with proved Westinghouse engineering backup—can give you many answers on motor costs.

DP-5001-B

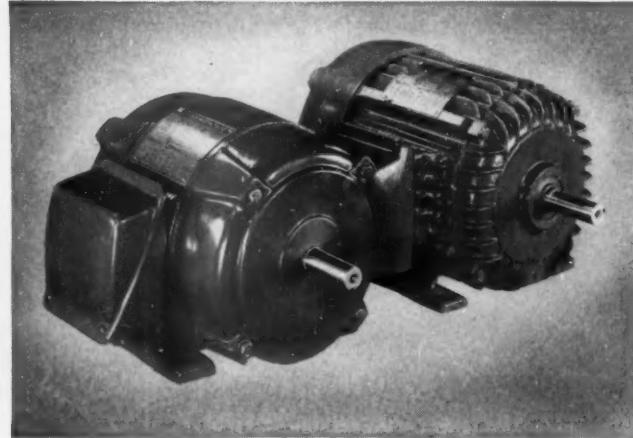
Here are more concrete examples, showing how intelligently engineered Westinghouse products save time and money for installers and operators . . .



AB-I circuit breakers provide complete protection against short circuits and high overloads. They can be reset quickly and safely after fault is cleared. Available for practically every NEMA application.



Change-over to AB-I breakers saved \$5319 the first year here. Yearly outage with fuse protection was costing \$5408. Westinghouse Circuit Breakers were recommended—dropped outage overhead to \$89...a 98% saving.



Life-Line "A"—newest addition to the Westinghouse motor line. Offers the many Life-Line savings and advantages...with new features to meet the ever-growing progress of industry. A power package that guarantees better performance.



Control centers provide flexibility for rearrangement of plant production lines. Starter units are interchangeable. And vertical structures can be arranged for any floor requirement—are easy to expand. DR-5001-C

**YOU CAN BE SURE...IF IT'S
Westinghouse**



*"From the meter to the load, coordinated
Westinghouse products save installation time
and operating expense."*



By applying Inerteen® Capacitors, power bills dropped nearly \$4000

Many plants—like this Midwestern concern—are amazed at how much improved power factor can lower operating costs.

The capacitor bank, here, is one of eight installed. They total 720 kvar and have raised power factor from 69 to 95%. Result: Motor performance improved through better voltage regulation. Power

bills have been cut by an average of \$315 a month—an annual savings of \$3780.

Westinghouse Inerteen Capacitors will bring similar savings wherever inductive equipment is used. They do it by applying nonproductive current direct to the load. This permits more of a system's capacity to carry useful working current. DP-5001-D

YOU CAN BE SURE...IF IT'S **Westinghouse**



Flexibility of plug-in bus duct speeds relocation of production machines

As part of an expansion program, an eastern plant was relocating its production machines. Further analysis showed how Westinghouse Plug-In Bus Duct would help minimize the job.

Due to the flexibility of plug-ins every foot, power was taken temporarily from the duct. And the plant moved 139 machine tools with less than five minutes down time per operator.

Up to 10-foot lengths, Westinghouse Bus Duct comes in prefabricated sections. It installs easily with cantilever hangers and can be expanded or relocated. Available in two types that accommodate all load and service requirements.



Installs quickly. Three men using a fork truck installed 755 feet of bus duct in four days at this same plant. Installation savings benefited not only the user but contractor as well . . . resulted in an additional lighting installation.



Power take-offs easy. Here's how easy it is to take off power from Westinghouse Plug-In Bus Duct: Slide cover away from plug-in receptacle . . . then plug in and fasten unit to duct.

DP-5001-E

And here's how good lighting pays off . . .



"Westinghouse helps you lower production costs with planned lighting. When people see better they do better."



Ventilated mercury high-bay fixtures cut maintenance...give more light at no extra cost

The modernization need at this Pennsylvania plant: Better lighting with less maintenance. The answer: A Westinghouse Ventilated Mercury High-Bay lighting system.

Mercury sources provided approximately three times more light than the previously used incandescent design—and last seven times longer. At a 48-foot mounting height—the case in this plant—this becomes exceedingly important.

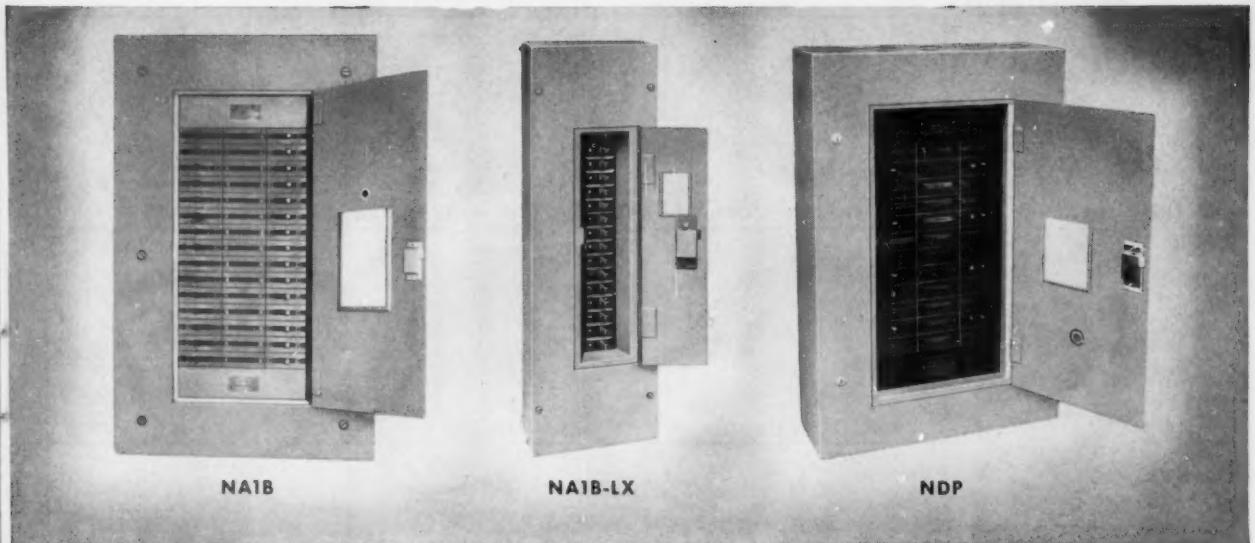
Additionally, the ventilated luminaires help keep reflectors clean . . . yet protect the lamps and provide a controlled lighting distribution system to

meet the specific application requirements.

Planned lighting *does* mean economy. The seeing requirement dictates the lighting system and equipment to be used.

Your Westinghouse Distributor stands ready to help you with your lighting problems—whether they involve the shop, office or parking lot. DP-5001-F

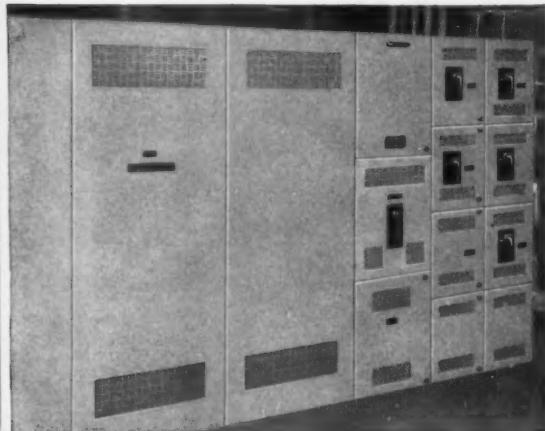
Here's more matched Westinghouse equipment: Dry-type power centers to bring high voltage closer to the lighting load . . . and modern circuit breaker panelboards which offer complete protection to lighting circuits . . .



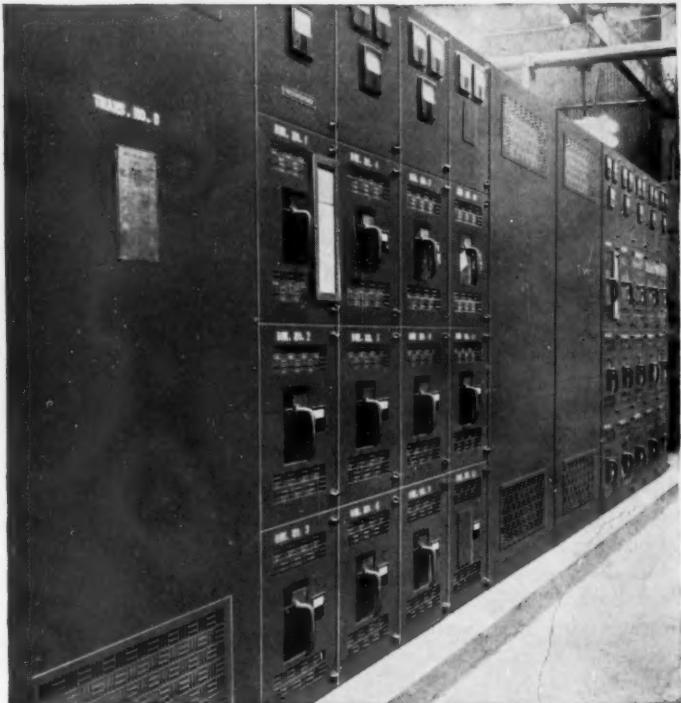
Westinghouse AB De-Ion® Circuit Breaker Panelboards give dependable protection to lighting and power circuits. There is a complete line available for surface, flush or column mounting. Circuit capacities range from 15 to 600

amperes, up to 600 volts a-c or 250 volts d-c in panels with either main lugs or main breakers. They cut down time because there are no fuses to store, match to the circuit or replace. A flip of the breaker handle puts you back in service.

DP-5001-G



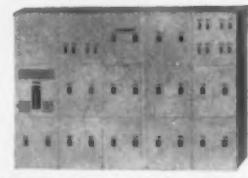
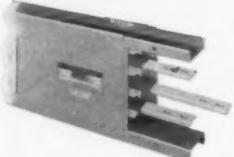
Westinghouse Power Centers assured more production output per kWhr used at an eastern metal-working company. This was brought about by improved voltage conditions and reduced line losses.



Dry-type power centers reduce operating costs. They combine transformer and circuit protecting equipment in a single unit—spotted close to the loads. Secondary runs are shortened; line losses lowered.

YOU CAN BE SURE... IF IT'S
Westinghouse



			
LIFE-LINE STARTERS	DRY-TYPE TRANSFORMERS	BUILDING-TYPE SWITCHBOARD	LIFE-LINE MOTORS
			
POWER	INDUSTRIAL LIGHTING	PANELBOARD	BUS DUCT
			
CAPACITORS	AB-I CIRCUIT BREAKERS		CONTROL CENTERS

The Westinghouse Distributor in your area offers you a complete electrical service

Regardless of your location, a Westinghouse Distributor is nearby—ready to serve your electrical needs.

He offers you from a single source a complete line of electrical equipment—coordinated Westinghouse products that install easily, feature both simplified and standardized design.

And through your Westinghouse Distributor you can get the engineering and product advice you require to help bring about better, more economical plant operation.

Put these combined services to work on your plant modernization programs. One call to the Westinghouse Distributor in your area does it.



Teams of Westinghouse Engineering and Product Specialists from the headquarters organization are available through your Westinghouse Distributor. Their mission: To help you analyze modernization problems . . . and select, coordinate and apply equipment.

DP-5001-H

YOU CAN BE SURE...IF IT'S
Westinghouse





Wesco offers you a complete line whatever your electrical needs...

Your job is being complicated more and more these days by the rapid advance in the world of electricity. New designs . . . new developments . . . new requirements are being made at an ever-increasing pace.

That's where Wesco can be of greatest service to you—for Wesco's business is knowing about and handling all types of electrical apparatus and supplies. We serve you as a *convenient, single source* of supply . . . meeting your needs with the greatest possible speed and efficiency.

Wesco has more than 18,000 electrical items at its fingertips . . . calls upon its vast electrical resources and years of experience

to meet your requirements with minimum delay. Readily accessible through Wesco's facilities are the best known brands of electrical products made by the nation's leading manufacturers. AND—where you have a special problem to meet, Wesco can bring to bear the resources of specially trained personnel, schooled in all types of modernization and new construction projects.

So—whatever your job—whatever your needs—you'll find Wesco especially equipped to offer the most dependable, up-to-date service. Before starting a new job, see your local Wesco salesman first. A Wesco office is as near as your telephone.

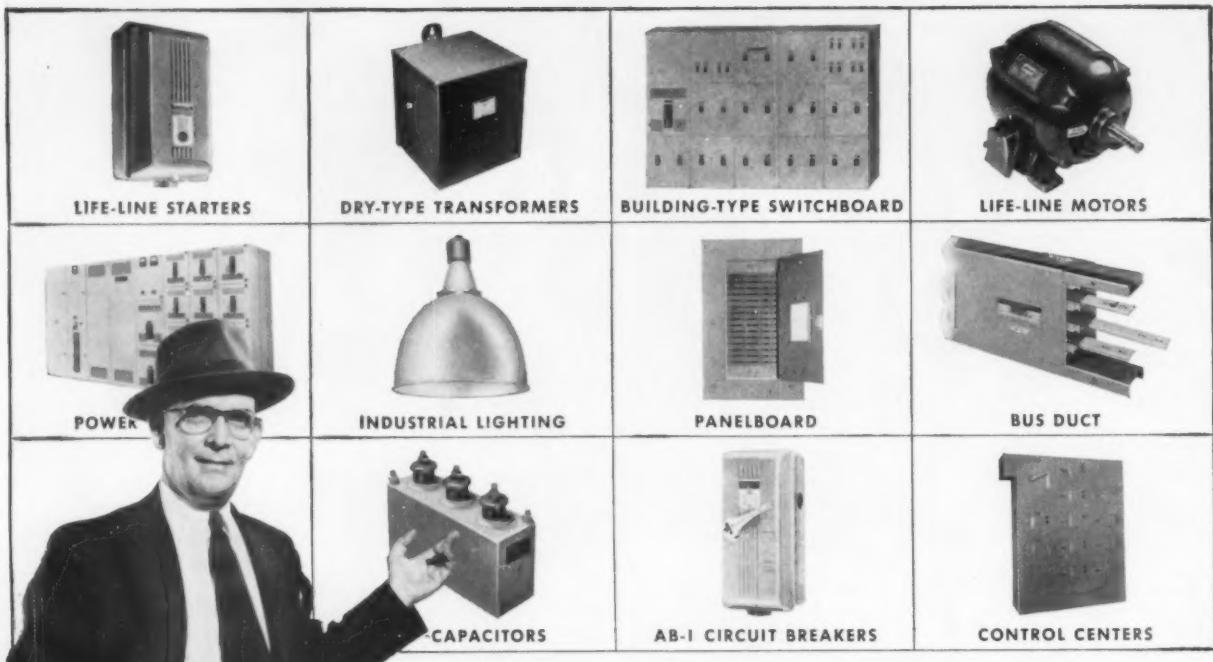


Westinghouse Electric Supply Co.

A NATIONAL DISTRIBUTING ORGANIZATION

115 BRANCHES SERVING CONTRACTORS AND MAINTENANCE DEPTS.





The Westinghouse Distributor in your area offers you a complete electrical service

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Westinghouse Electric Supply Co.

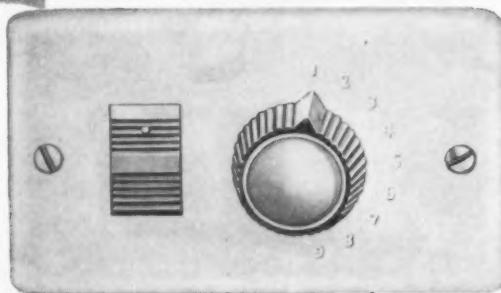
A NATIONAL DISTRIBUTING ORGANIZATION

115 BRANCHES SERVING CONTRACTORS AND MAINTENANCE DEPTS.



NEW!

RYANT LOW VOLTAGE MULTI-CONTROL WIRING SYSTEM



**Easy,
Economical
Installation—**

New System offers advantages of
LOW VOLTAGE control of lighting
and appliance circuits from con-
veniently located points.



**New profit
opportunities
for you**

**For all
types of
buildings**

**Added
safety and
convenience**

The RYANT MULTI-CONTROL Wiring System is the most modern method of controlling electrical circuits. Through the use of small relays, usually mounted in conventional outlet boxes, which are actuated by low voltage switches, lighting and appliance circuits may be economically controlled from one or any number of desired locations. Another outstanding feature, not available in conventional wiring systems, is the Master Switch Control. One or more master switches may be installed at strategic locations for the control of any number of circuits.

This switching system operating on low voltage, is safer and the use of less costly conductors is possible. Flexibility, versatility and economy of installation are outstanding features of this system.

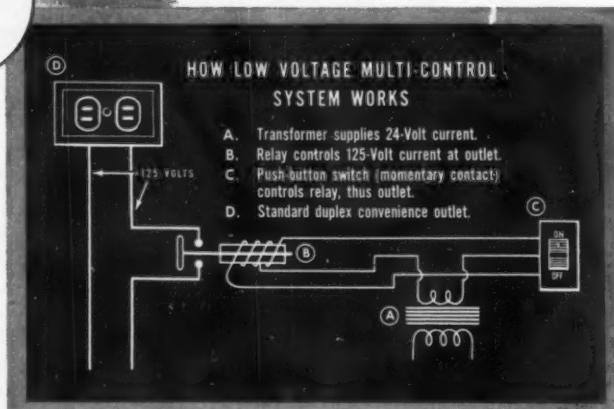


Diagram shows basic circuit of the Bryant system.

For complete information write —

THE RYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

Chicago • Los Angeles



J-99907

Practical Methods

Sign Signals Change of Model

PRODUCTION CONTROL

Automatic transmissions, at the rate of some 4,000 per day, come off the assembly lines at the Willow Run plant of the Detroit Transmission Division, General Motors Corporation. Most of them are for various makes and models of General Motors cars. Others are produced for other car manufacturers such as Nash, Hudson, Willys, Kaiser and Lincoln.

Some automatic transmission parts are common to all Hydramatic assemblies. Other parts go only into Hydramatic assemblies for specific models or makes of cars. Employees in the dust-free, controlled-temperature assembly room at Willow Run must know when a model change is coming through so they can have the proper parts available along the assembly lines.

Normally, the assembly room is given an hour's notice when a model change is coming up. To provide visual notification, as well as verbal, DTD engineers designed a large electric sign with neon letters spelling out the make of car and transmission model number for each. Four of these signs are installed at visual vantage points in the assembly room and one is located in

the shipping department. Each sign is made up of the following neon lettering:

NASH E N NA Y....WILLYS
HUDSON H J Z.....KAISER
CHEV 180CH 220CH 200HC
GMC 177C 210U 220G 220Y
245G
CADILLACLINCOLN
OLDSMOBILE R RA.....
PONTIAC

When notification of a model change is made, a flip of a switch lights up the name of the car and transmission model number on the huge signs which are visible to employees on the subassembly and final assembly lines. This remains on until another model change is due, when the switch is turned off and another one is operated to indicate the next make and model number to be assembled.

A similar sign in the shipping department notifies those employees which racks to have available for the next group of transmissions. Different Hydramatic models require different racks. DTD production engineers find these electric signs provide an efficient way of coordinating work during assembly of different Hydramatic models.



VISUAL NOTIFICATION of model change is the function of these large electric signs in the assembly department of the Detroit Transmission Division, General Motors Corp., Willow Run plant. Neon lettering denotes make of car and Hydramatic model number being assembled. Illuminated letters on sign indicates unit for Oldsmobile 98 car.



WIRE PULLING is an easier job these days for Percy Enefer, transmission and distribution man with British Columbia Electric Co., who won a prize for his new method of pulling wires in conduit. Basically, idea is simple: string is attached to a small canvas bag, bag is put in conduit and then compressed air is used to blow bag through conduit. Flexibility of bag permits it to pass obstructions which might normally block solid projectiles. Pulling the wires back in is then a simple task.

Telephone Call Indicator

SIGNAL

Herb Nelson, building engineer for the Santa Fe building in Los Angeles, has successfully solved a problem which previously was a source of continual annoyance. Invariably when he was away from his desk on duty around the building, his phone would ring. Upon his return to his desk, he had no way of knowing that a call had come in without checking with the building telephone operator. Since he might leave his desk ten or twelve times per hour, calling the operator each time he returned was a nuisance, and considered extremely impractical. Through special arrangement with the telephone company, he devised and installed an indicator which told him at a glance when a call had been received. A bare colored lamp (right, in photo) was installed on a column at his desk. It was controlled by a relay in the top box (photo) which was actuated by a relay in the center box, and was held "on" until the telephone receiver was lifted. Each time the operator rings his phone, the light flashes on automatically, and thereby stays on until he returns to his desk and lifts the receiver. He then asks the operator for the message or number of the person

FURNAS ELECTRIC

Magnetic Starters



Your
most
complete
selection
in the
1-50 hp
range

**NEW "IN-BETWEEN" SIZES
SAVE ON COSTS AND
UP TO 40% IN SPACE**

Why Pay for Starter Capacity You Never Use?

Now you can select the exact starter size matched to any application in the 1-50 hp range from the nine Furnas Electric sizes. Many in-between sizes can save you money and conserve space. Immediate delivery from stock.

Same Service, Less Money—Here's an example of how you can save: Suppose you want a starter for 10 hp service. It's no longer necessary to select a size 2 rated 25 hp. You save in cost and up to 40% in space by selecting a Furnas Electric type YE, the right starter for the job.

Important Features—1. Dual voltage coils matched to your motor. 2. Four-speed thermal overload protection. 3. Easy installation and wiring in shallow case. 4. Heavy contacts for long life.

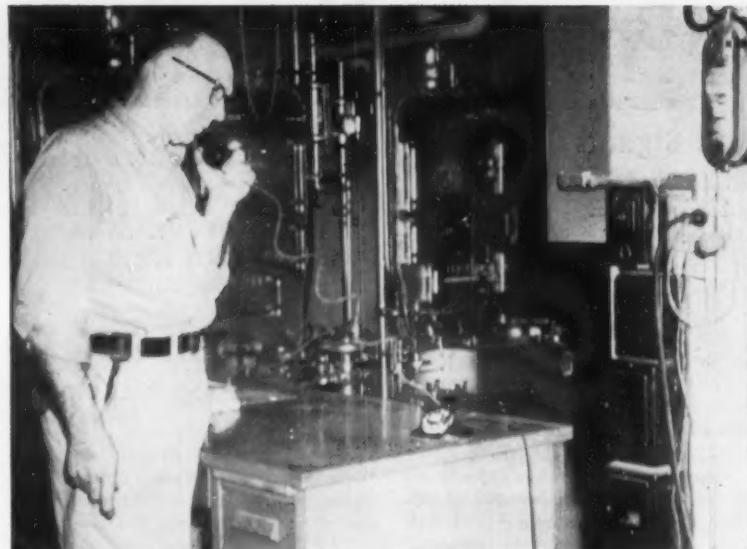
Complete Range of Other Products

—Pressure switches for air and water applications. Drum controllers for reversing, multi-speed and reversing multi-speed service.

Write today for Bulletin No. 5402, giving the full story. Furnas Electric Company, 1067 McKee Street, Batavia, Illinois.

FURNAS
ELECTRIC

Batavia, Illinois



BARE LAMP at right serves as indicator that a telephone call has come in for Herb Nelson, engineer for the Santa Fe building, Los Angeles, while he was away from desk on duty around building. Lamp flashes on when operator rings, stays on until receiver is lifted from hook.

calling him. Use of this special hook-up enables him to know at a glance each time he returns to his desk whether he has been called, and to re-

turn the call promptly if he has. If the indicator light is not on, he can proceed with other duties, knowing he has missed no important calls.

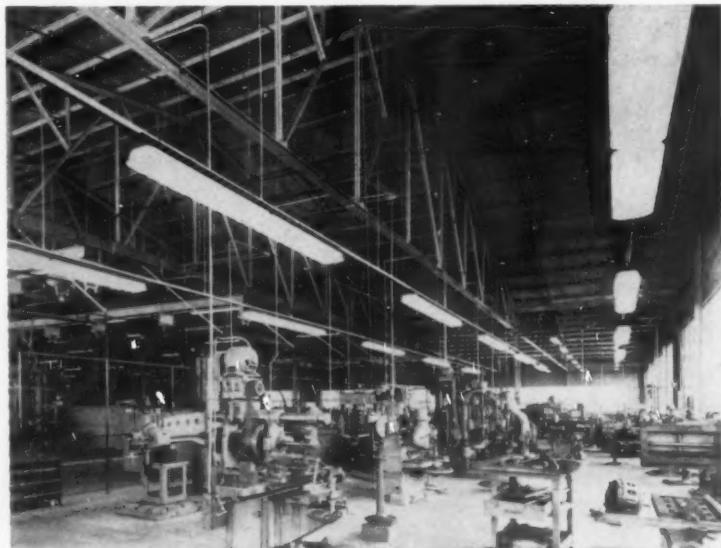
Surface Raceway Lighting System

WIRING

Metal surface raceway today provides a rugged, flexible wiring system for quality illumination in the one-floor plant (440 by 200 feet) of Edwin H. Fitler, New Orleans, La. Here fluorescent luminaires are suspended from nearly two miles of surface raceway runs in the plant. The installation was

made by Gibson and Odom, electrical contractors, New Orleans, La.

Originally, a messenger cable wiring system was to be installed, with short lengths of EMT coupling luminaires to line. The advantages of using surface raceway, however, finally prevailed. It was recognized that the surface raceway system would offer the



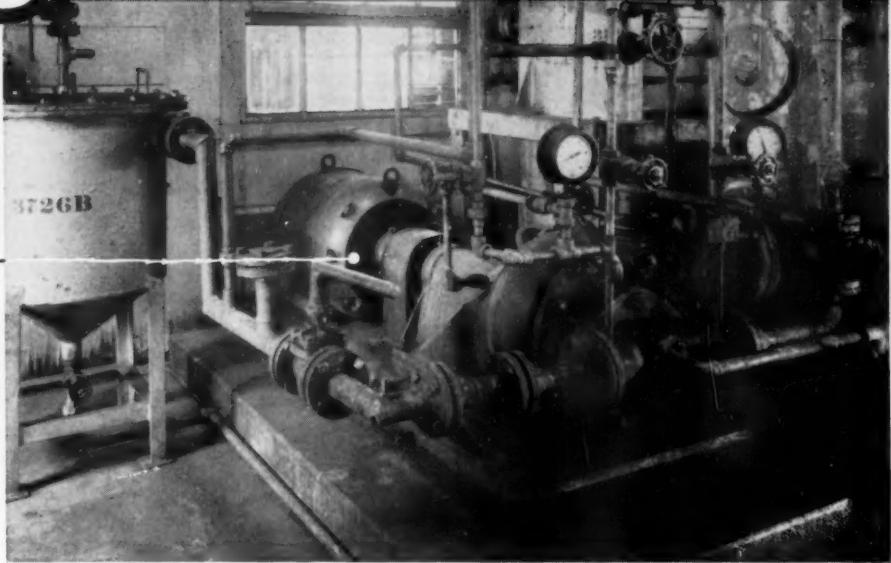
SURFACE RACEWAY provides the extensive wiring system for a modern fluorescent lighting installation in this large industrial plant interior.

DOW CORNING
SILICONES

give motors more muscles

**Upgrade 40 hp
Compressor
Motor**

**by 25%;
Eliminate
Shut downs;
Save \$1500**



In one step of a complicated production process worked out by Sharples Chemicals Inc. of Wyandotte, Michigan, a conventional 40 hp compressor motor is used to liquify hydrogen sulfide. When other steps in the process were streamlined to increase production, a heavier load was placed on this motor as indicated by an increase of about 17% in its power consumption.

As a result, thermal breakers frequently shut off the motor. The entire process was interrupted; production costs were increased; and an objectionable gas backed into the idle compressor and leaked into the building.

On inquiry, the motor manufacturer suggested that the old motor be upgraded by rewinding with silicone (Class H) insulation rather than install a

new 50 hp motor costing \$2,000. Following this recommendation Sharples engineers had the motor rewound with Class H materials at a cost of only \$450 or less than one-fourth the new motor cost.* Reinstalled with higher thermal breakers, that rebuilt motor is still operating after two years of service without causing a single shut-down.

If increased production demands or tough operating conditions are limiting the life and performance of your electrical equipment, put Class H insulation to work for you. Available from all leading rewind shops and on order from new equipment manufacturers, motors insulated with Class H materials made with Dow Corning silicones last 10 times as long or deliver up to 50% more power than conventional motors of the same size.

* Rewound by Howard Electric Company, Detroit, Mich.

mail this coupon today!

You can also reduce to a minimum motor outages due to bearing failure by using Dow Corning 44 Grease

In open and single shielded bearings designed for high temperature operation, Dow Corning 44 has 8 to 10 times the life expectancy of conventional greases. It gives life-time lubrication in permanently sealed bearings.

Branch Offices



MIDLAND, MICHIGAN

Dow Corning Corporation, Dept. G-19, Midland, Michigan

Please send me

- More performance data on Class H
- List of Class H rewind shops
- List of Class H Motor and Class H Transformer Manufacturers
- "Tall Tales and Fabulous Facts" about silicone products

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

ATLANTA • CHICAGO • CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEW YORK • WASHINGTON, D. C.
Canada: Dow Corning Silicones Ltd., Toronto • England: Midland Silicones Ltd., London • France: St. Gobain, Paris
(SILVER SPRING, MD.)

JOINED for LIFE with DOSSON SERVICE CONNECTORS



Type
DS

The choice of connectors is wide, but there's a big difference when you choose a Dossen. Years of testing under the worst weather and corrosion conditions give undisputed proof of Dossen's permanent grip. Makes quick, simple, efficient connections for solid and stranded conductors in sizes No. 14 to 1000 MCM. High contact pressure between conductors assures maximum security... eliminates maintenance. Check these important Dossen features:

- 1) High translation of torque by low coefficient of friction
- 2) High contact pressure
- 3) Free from vibrational loosening
- 4) Withstands high tightening torque
- 5) Maximum contact area
- 6) Made of high strength "DURONZE" alloy
- 7) Better conductivity
- 8) High corrosion resistance
- 9) Economical—use over and over again
- 10) Dossert precision-manufactured

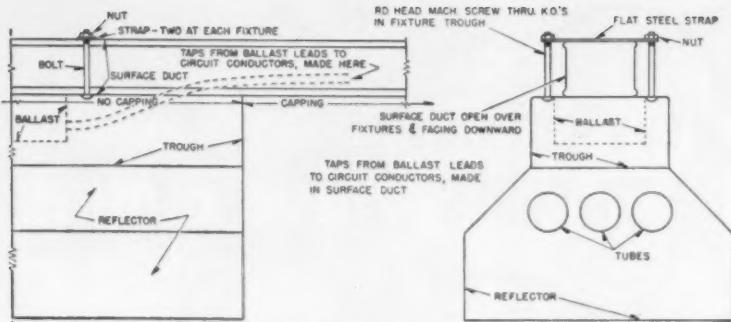
IN STOCK FOR IMMEDIATE DELIVERY!

50
YEARS OF
TECHNICAL
KNOW-HOW

DOSSET REPRESENTATIVES IN PRINCIPAL CITIES

DOSSET
MFG. CORP.

249 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904



MOUNTING DETAILS of fixtures and surface raceway, installed by Gibson and Odom, electrical contractors, New Orleans, La.

high current capacity needed for high footcandle levels, that the problem of low voltage at luminaires would be eliminated, that installation would be clean and easy, that future changes in the system could be easily accomplished

at any time and that efficient, trouble-free operation could be expected.

Suspension of the fixtures is shown in the illustration. The duct is suspended from the roof by means of steel straps fastened to fitted hangers.

Special Truck Simplifies Pole Hauling

CONSTRUCTION

Pole hauling and handling have been simplified with a substantial saving of time and labor by Dayton Power and Light Company, Dayton, Ohio. Using a pole hauler and special truck equipment for hoisting two men easily and quickly load and unload poles of any length.

Loading and unloading are accomplished with a crane and a winch—both Gar Wood products—mounted side-by-side behind the cab of a GMC truck. With the pole hauler hooked to the truck, one end of a pole is lifted and swung onto the truck with the crane. The winch, pulling cable through a sheave and mastboom equipment on one end of the pole hauler, skids the other

end of the pole up an I-beam ramp onto the pole hauler. Both the crane and the winch operate independently through the same power take-off.

The crane has a 1.9 ton capacity at 6-ft 3-in boom radius and one ton capacity at 12-ft boom radius. It can also be furnished with other capacities. Power hoisting and lowering of the load are controlled by a single lever at the side of the crane frame which operates a reversing gear box to positively control hoisting, holding and lowering of load.

A self-energizing, completely automatic safety brake on the winch will stop and hold any load up to winch rating of 15,000 pound capacity line pull.



POLE HAULER hooked onto GMC truck equipped with powered crane and winch facilitates hauling and handling any length poles by a two-man crew.



CHEMICAL



STEEL



GLASS



METAL FABRICATION



RAILROADS



PAPER



RUBBER



AUTOMOTIVE



AVIATION



MINING



PUBLIC UTILITIES



FOUNDRY



PROVED ON THE JOB!

Trumbull's New Approach to Switch Design

Style HCI incorporates basic improvements in safety switch design. Built to take more electrical punishment than your present loads will give it. Rugged enough to be as good as new years from now when its full capacity is needed. Successfully tested for use with current limiting fuses.

Revolutionary five years ago — today, proved on the job, coast to coast. Style HCI is the soundest investment you can make in switch safety, dependability and long range economy. For literature write General Electric Co., Trumbull Components Dept., 42-62 Woodford Ave., Plainville, Conn.

Front Operated for compactness. Both handle and cover can be locked, on or off, with a single padlock. If desired up to four padlocks can be used.

G-E Pole Units of exclusive circuit breaker arc quenching and heat dissipating design. Visible contacts. Quick make-quick break — will withstand heavy shorts.

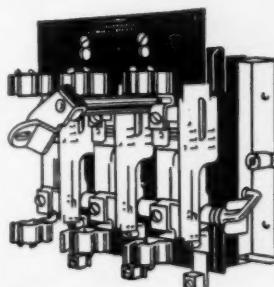
Line Shield as standard feature — no exposed live parts

when switch is OFF. Quickly removable interiors and ample wiring space for easy installation and maintenance.

Semi Dust Tight Enclosure (NEMA 1-A) at no extra cost. Bonderite® treated for increased corrosion resistance. New 70% lighter Water-Tight and

Dust-Tight lead plated enclosures available (NEMA 4 & 5). AMIERE RATINGS 30-60-100 & 200 fusible and no fuse.

HCI Disconnect Switches provide advantages for a wide range of product applications of the Original Equipment Manufacturer. Ideal for use in switchboard, panelboard and industrial control applications.



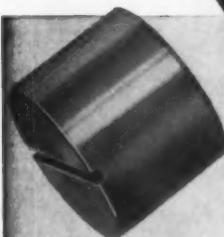
Progress Is Our Most Important Product

GENERAL  **ELECTRIC**

* T. M. REG. PARKER RUST-PROOF CO.

Monarch

"FLOWS" BRASS to FIBRE to give
you a QUALITY FUSE with
LONGER LIFE!



Monarch is the only fuse with this new construction feature. Fibre barrels cannot loosen from brass fittings. There are no rivets or pins to cause hot spots and char the fibre barrel. It means you get a quality fuse with better protection . . . over a longer operating period . . . and at the regular fuse price.

Ask your wholesaler now or write for further information.



Monarch Fuse Co., Ltd.

Jamestown, New York



Magnetic Separator For Steel Handling

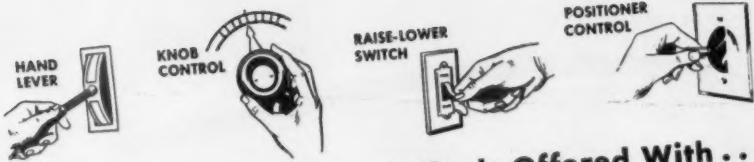
PRODUCTION

Use of magnetic separators in the punch press department of the New York plant of Cutler-Hammer, Inc., has resulted in significant savings in labor costs and almost completely eliminated injuries from one phase of the firm's operations. Cutler-Hammer reported that since installation of the separators in this plant last year a 5% savings on labor has been achieved. Cutler-Hammer makes switchboxes and covers in its operation, using 16- and 18-gauge steel sheets of varying sizes. Prior to the introduction of the separators, wear and tear on the operators' gloves was considerable; and this is an additional cost that has been cut greatly.

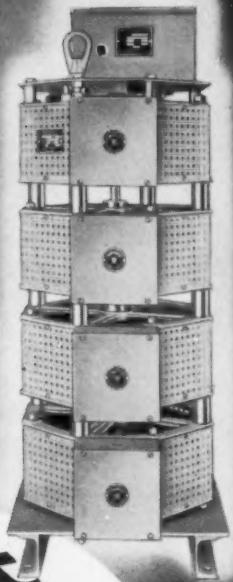
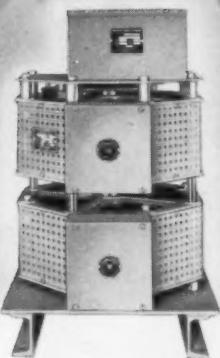
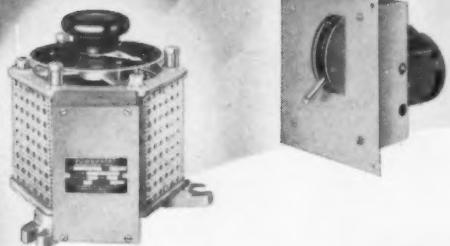
Photo shows an operator at Cutler-Hammer's New York plant first lifting a steel sheet before inserting into the punch press. Action of the separator has raised the top sheet making lifting simple. As the operator inserts the first plate into the press, the next plate is already raised from its mates and ready to be lifted. Before introduction of the separator, a sharp metal instrument was used to separate the sheets. The result was great wear and tear on gloves and numerous painful hand cuts among the workers. This has been eliminated by the separator. Where polished or specially finished sheets were necessary, the results with the separator were superior.

The separator employs a magnetic principle, inducing a magnetic field among the stacked sheets causing them to tend to repel each other. Thus the ends fan out leaving air space between each sheet.

In the Cutler-Hammer plant, the magnetic separator unit is located, as shown in the photo, close to the punch press. In addition to the elimination of hazard, the use of the separator has boosted efficiency and increased productivity. The separator was manufactured by Basco Mfg. Co.



The Variety of Control Methods Offered With ...



Powerstat NON-INTERLOCKING Light Dimming Equipment

**Assure you of
the most suitable
installation for
your dimming
application.**



**SUPERIOR ELECTRIC
COMPANY**

6074 Demers Ave., Bristol, Conn.

Manufacturers of: Powerstat Variable Transformers • Stabiline Automatic Voltage Regulators • Vollbox A-C Power Supplies • Powerstat Light Dimming Equipment • Varicell D-C Power Supplies • Superior 5-Way Binding Posts

NON-INTERLOCKING POWERSTAT Dimmers are continuously-adjustable autotransformers . . . ideal for single circuit use — controlling footlights, auditorium lighting and any single room installation. Standard manually-operated (hand lever and knob) and motor-driven assemblies are available in capacities from 1,000 to 30,000 watts. Motor-driven types provide effortless, "finger-tip" operation by "raise-lower" switch or remote positioner controls.

Visit the Superior Electric's Mobile Display when it is in your area.

THE SUPERIOR ELECTRIC COMPANY
6074 Demers Ave., Bristol, Conn.

Please send Bulletin D851N on POWERSTAT Non-Interlocking Light Dimming Equipment.

Name.....

Company Name.....

Company Address.....

City..... Zone..... State.....



How Kennecott boosts your re-wiring business!

Look at the advertisement on the opposite page. It means money to you . . . money made from one of the largest, most potentially profitable parts of your business—that of *residential re-wiring*.

As you see, it's an advertisement signed by the Kennecott Copper Corporation and it tells homeowners about one of the many inconveniences of living in an inadequately wired home.

This is but a single advertisement in a complete, powerful series now appearing in the pages of the Saturday Evening Post and This Week magazines. This one advertisement alone will reach more than 15,130,000 readers. It will *blanket your own territory*. Other full page advertisements will continue to hammer home to your prospects and customers the

inconveniences and discomforts of weak, overloaded household wiring.

Here, at last, is the powerful, national advertising campaign you've long wanted to back up your own sales of re-wiring jobs!

It's a real, hard-hitting *educational* campaign that *pre-sells* your prospects for re-wiring. *And surveys show that more than 80% of the homeowners in your territory need that re-wiring service of yours today!*

Tie-in with Kennecott!

It will pay you to key your own local home wiring and re-wiring sales efforts to this national advertising drive that so obviously promotes your interests. Inquire today about reprints and poster-sized blow-ups of these advertisements for your mailings, for display. Write Kennecott Copper Corporation, 161 East 42nd Street, New York 17, New York.





They're showing old-fashioned "flickers" in so many homes these days!

Bright! Dim! Bright! Dim! Annoying, isn't it? Yet, you'll find lights flickering like this in 80% of America's homes. Why? Because the wiring in most homes today is just plain *outdated*. Wires are too small, circuits too few, to feed enough electricity to the scores of new appliances people have bought in recent years!

Take your own home. If it's 10 or more years old, you can be *sure* its original wiring cannot carry all the current needed. Even if your house

is brand-new, its wiring may become overloaded if you add only one new appliance! For instance, a room air conditioner or a laundry dryer.

But, whether your house is old or new, remember this — if its wiring is weak, you're putting up with *more than annoyance*. You're wasting money in lost current. You're risking fire from overloaded, overheated wires!

So, if your home has the "flickers," don't laugh it off. Talk it over with your local electrician!

Published for your information by

Kennecott
COPPER CORPORATION

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. KENNECOTT WIRE & CABLE CO.

Look To Your Electricity!

✓ If you own a house, see your electrician. He will gladly make a study of your wiring system, tell you what work if any may be needed, and its cost.

✓ If you plan to buy a house, don't forget to check up on the age and capacity of its wiring. Better still, have an electrician inspect it for you!

✓ If you are going to build, be sure to plan your wiring for the future as well as the present. Remember that on the average, your electrical needs increase 10% every year!

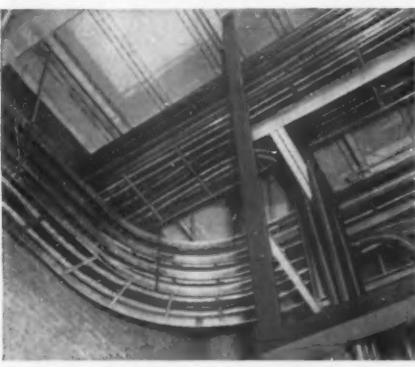
Kennecott Copper Corporation,
161 E. 42nd St., New York 17, N. Y.

This advertisement will appear, with a circulation of 15,130,000, in the Saturday Evening Post and in This Week. Other Kennecott advertisements will also feature adequate wiring to architects and builders.

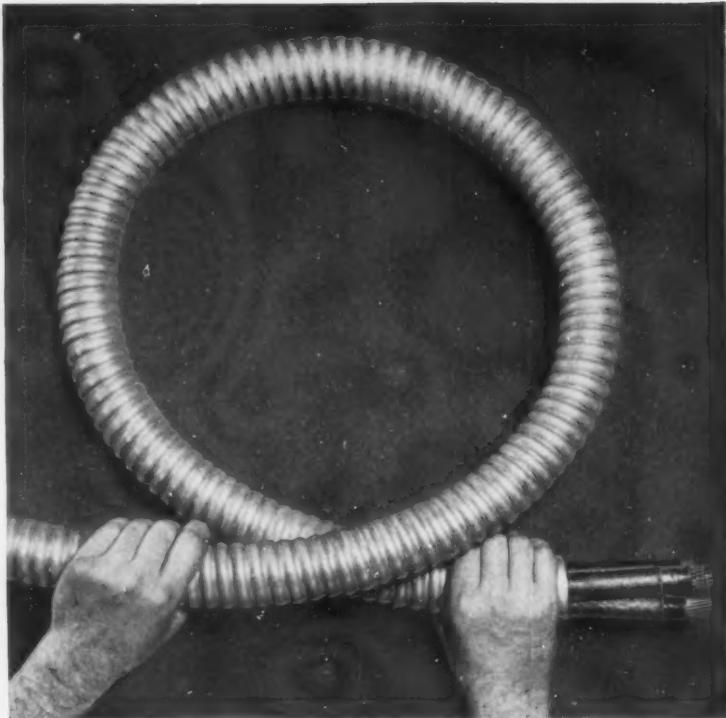




A lightweight aluminum trough is sufficient support for G-E V-c interlocked armor cable. Use troughs for long runs of single cable and keep splicing to a minimum. All splices are a simple mechanical job done right on the site.



The cable is always accessible for alterations and additions. Use racks for multiple runs of large cable and baskets for small cables. The cable is easy to string and can often be pulled by hand around bends and angles.



G-E V-c interlocked armor cable is easily bent around sharp corners and projections. The system weighs only about a third as much as most cable systems. There is an easy method of installation to meet any condition.

This lightweight, flexible G-E cable SPEEDS INSTALLATION of feeder systems

The light weight and extreme flexibility of G-E V-c interlocked armor cable systems make them adaptable to all wiring conditions. Right angle bends, long runs and close-quarter installations are easier to make and cost less than conventional cable and conduit. Using G-E V-c interlocked armor cable assures your customers of long-lasting, trouble-free feeder systems. *To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.*

For more information on the ease of installation and the economies of using G-E V-c interlocked armor cable, write Section W131-718, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product



GENERAL ELECTRIC

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS →

● PRODUCT NEWS, PRODUCT BRIEFS:

Use first line of boxes. Insert item numbers of products on which more information is desired.

● CATALOGS, BULLETINS AND ENGINEERING DATA:

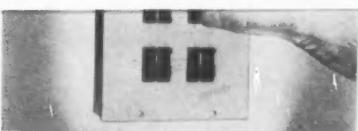
Use second line of boxes. Insert item numbers of literature desired.

● ADVERTISEMENTS:

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT . . .

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP



Circuit Breaker

(2)

Type "R" circuit breaker for the residential construction market. It incorporates many features including a positive action mechanism which enables the contacts to break instantly, thereby protecting them from excessive burning and arcing. It has a trip indicating handle. When a short circuit or an excessive overload trips the breaker, the handle moves to a mid position between On and Off. One glance at load center shows which breaker is tripped. The circuit is closed by moving handle to Reset and then to On. Even if

Lima Electric Mfg. Company, Lima,
Ohio.

Cutouts

(4)

A complete new line of 100-ampere open type distribution cutouts in voltage ratings of 5.2, 7.8 and 15 kv. The line, designated HDO, features standard-duty, intermediate-duty, and heavy-duty fuse cartridges with or without a load break device. Cartridge assemblies in the three duty classes offer interrupting capacities of 3000, 5000, and 10,000 amps at 5.2 and 7.8 kv and 2000, 4000, and 8000 amps at 15 kv. They are also available with 200-ampere switch blades. In addition to the standard single-insulator mounting, they are available with either post type insulator mounting or BIL insulator mounting.

Lima Electric Mfg. Co., Milwaukee 1, Wis.

A new deep-bodied device cover, cataloged as 1710 CB, is designed to accommodate all standard makes of single-pole circuit breakers in sizes from 10 to 50 amperes. This new fitting is particularly adaptable for Surfaceduct electrical surface raceway installations where individual circuit breaker control is desirable for air conditioning units or other applications requiring individual equipment control. Cover enables circuit breaker to be mounted quickly and easily within the Surfaceduct raceway. Cover snaps on the raceway in the same manner as the standard capping. With each cover, mounting bridges and screws are supplied, to which cover mounts permanently and locks to duct. Cover is made of 19 gauge steel, has gray enamel finish, and measures 6 by 2½ inches.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

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7/54

Product News and Product Briefs, Item Number

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Catalogs and Bulletins, Item Number

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Advertisement on Page

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NAME. TITLE.

COMPANY

ADDRESS

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER SEPTEMBER 1, 1954

7/54

Please send me without obligation further information about the following:

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Advertisement on Page

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NAME. TITLE.

COMPANY

ADDRESS

ELECTRICAL CONSTRUCTION AND MAINTENANCE — A McGraw-Hill Publication

NOT GOOD AFTER SEPTEMBER 1, 1954

Your Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.

PLACE 2¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

PLACE 2¢
STAMP
HERE

The Editor
ELECTRICAL CONSTRUCTION AND MAINTENANCE
330 West 42nd St.,
New York 36, N.Y.

Your Name and address are photographically reproduced and sent to the appropriate manufacturers. Illegible or incomplete addresses may result in your not receiving the information you desire.



Support single cables by messengers attached to existing buildings and beams for low-cost runs between buildings and across open plant areas.

FOR MORE INFORMATION ON

NEW PRODUCTS CATALOGS, BULLETINS ADVERTISEMENTS

USE THESE CARDS

● PRODUCT NEWS, PRODUCT BRIEFS:

Use first line of boxes. Insert item numbers of products on which more information is desired.

● CATALOGS, BULLETINS AND ENGINEERING DATA:

Use second line of boxes. Insert item numbers of literature desired.

● ADVERTISEMENTS:

Use third line of boxes. Insert page numbers of advertisements on which additional information is desired. Where more than one advertisement appears on the page, include the manufacturer's initials.

IMPORTANT . . .

- PLEASE PRINT LEGIBLY
- USE BLACK OR DARK BLUE INK
- DO NOT USE PENCIL OR RUBBER STAMP

tomers of long-lasting, trouble-free feeder systems. To our knowledge, no installation of interlocked armor cable has ever suffered mechanical damage sufficient to cause electrical failure.

For more information on the ease of installation and the economies of using G-E V-c interlocked armor cable, write Section W131-718, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

Progress Is Our Most Important Product



GENERAL  **ELECTRIC**

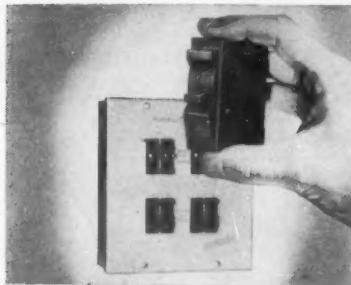
Product News



Aluminum Cable Adapter (1)

With this new aluminum cable adapter, interchangeable use of aluminum and copper electrical conductors in switch and control equipment is now possible. Adapter is made in straight and right angle types for Nos. 4 and 2 stranded aluminum cable. Made from a special tin-plated copper alloy, the adapter is designed to combine electrical conductivity with springiness. It has a round barrel from which extends a smaller, split cylinder called a tang. The barrel fits on the cable and the tang is inserted under the equipment clamp. The slot that splits the tang extends into the barrel, forming two legs. When clamped, the adapter's legs are squeezed together like cantilever springs. The adapter is recommended for meter enclosures, other enclosed electrical terminal connections and for connecting cable to exposed pole-line equipment, such as transformers, cutouts, capacitors, etc.

The Thomas & Betts Company, Elizabeth, N. J.

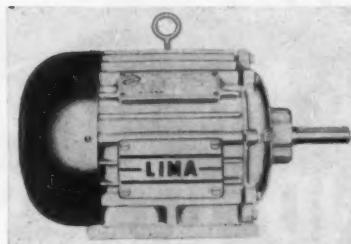


Circuit Breaker (2)

Type "R" circuit breaker for the residential construction market. It incorporates many features including a positive action mechanism which enables the contacts to break instantly, thereby protecting them from excessive burning and arcing. It has a trip indicating handle. When a short circuit or an excessive overload trips the breaker, the handle moves to a mid position between On and Off. One glance at load center shows which breaker is tripped. The circuit is closed by moving handle to Reset and then to On. Even if

handle is held on, trip free contacts will open under an excessive overload or short circuit. Straight-in wiring plus a simple plug-in arrangement for mounting in a stab assembly provides easy installation. A full line—15, 20, 30, 40 and 50 amperes, 120 volts ac, single pole—is available. Type "R" is listed by Underwriters' Laboratories, Inc.

The Trumbull Components Department of General Electric Company, Plainville, Conn.



Explosion-Proof Motor (3)

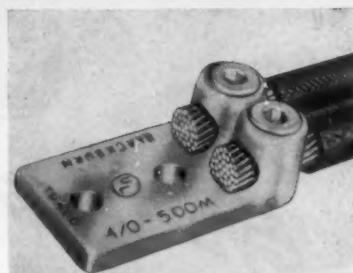
New Type EX explosion-proof motor and Type ED dust-tight motors are available. Type EX is designed for use in hazardous locations where gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors and natural gas are present. It is a totally enclosed, fan-cooled, explosion-proof, UL approved motor for Class I Group D service. Type ED is designed for use where hazardous grain dust, carbon black, coal or coke dusts exist. It is totally enclosed, fan-cooled, dust-tight and UL approved for Class II Groups F & G Service. Both motors are available in ratings of $\frac{1}{4}$ hp to 20 hp in NEMA frame sizes 224 to 325 inclusive, for operation on 2- or 3-phase, all commercial frequencies and voltages below 600. A specially designed external fan forces air at high velocity over the outside of the motor.

Lima Electric Motor Company, Lima, Ohio.

Cutouts (4)

A complete new line of 100-ampere open type distribution cutouts in voltage ratings of 5.2, 7.8 and 15 kv. The line, designated HDO, features standard-duty, intermediate-duty, and heavy-duty fuse cartridges with or without a load break device. Cartridge assemblies in the three duty classes offer interrupting capacities of 3000, 5000, and 10,000 amps at 5.2 and 7.8 kv and 2000, 4000, and 8000 amps at 15 kv. They are also available with 200-ampere switch blades. In addition to the standard single-insulator mounting, they are available with either post type insulator mounting or BIL insulator mounting.

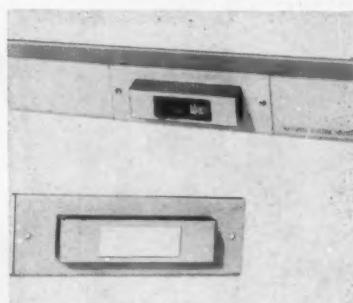
Line Material Co., Milwaukee 1, Wis.



Terminal Lugs (5)

Multimount and Twinlug have been added to this line of solderless terminal lugs. Multimount is a single conductor lug with two mounting holes. Four sizes are required to cover a wire range from No. 4 to 1000MCM. The Twinlug is a double barreled lug designed to take two parallel conductors with a common mounting tang. Three sizes cover a wire range from 1/0 to 1000 MCM. The new lugs are heavy castings of high strength bronze with machined tangs. Both are available with either hexagon head or socket head screws. These lugs are designed for indoor or outdoor use.

Jasper Blackburn Corporation, 35 Madison St., St. Louis 6, Mo.



Fittings (6)

A new deep-bodied device cover, cataloged as 1710 CB, is designed to accommodate all standard makes of single-pole circuit breakers in sizes from 10 to 50 amperes. This new fitting is particularly adaptable for Surfaceduct electrical surface raceway installations where individual circuit breaker control is desirable for air conditioning units or other applications requiring individual equipment control. Cover enables circuit breaker to be mounted quickly and easily within the Surfaceduct raceway. Cover snaps on the raceway in the same manner as the standard capping. With each cover, mounting bridges and screws are supplied, to which cover mounts permanently and locks to duct. Cover is made of 19 gauge steel, has gray enamel finish, and measures 6 by $2\frac{1}{2}$ inches.

National Electric Products Corp., Gateway Center, Pittsburgh, Pa.

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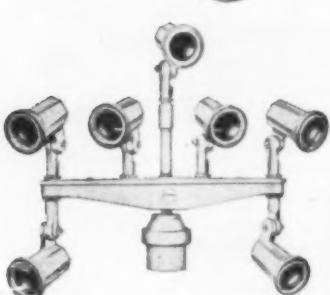
LAMP HOLDERS AND ACCESSORIES



Cat. No. YL-50—Deluxe
Yard-Light with vapor-
proof fitting and globe.

SMART NEW DESIGN, CAST ALUMINUM, GLEAMING CHROME-
LIKE FINISH • WEATHER RESISTANT • MINIMUM POROSITY
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Combination of No. 134
Trough, 7 No. 136 Lamp
Socket Units, No. 138 2"
Pipe Slip-Fitter, No. 190
4" Extension.



Cat. No. 177—Y-Type
Flange Splice Box.



Cat. No. 137—Mogul
Base Holder fully en-
closed with 20" fixture
wire.



Cat. No. 136—Lamp
Holder for PAR-38
Bulb, wired with 20"
fixture wire fully
enclosed.



Cat. No. 175-B—All Metal
Spotlight Holder com-
plete with 6' cord, rub-
ber plug. Furnished with
separate weatherproof
gasket, with spike.



Cat. No. 230, 231, 232, Vapor-
proof globe fittings; No. 207
Y Type acorn.



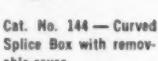
Comb. No. 207 Y-Type
Acorn, 4 No. 136's.



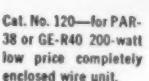
Cat. No. YL-40—Deluxe Yard-
Light with green and white
enamel shade.



Cat. No. 206—Acorn
Splice Box with remov-
able lid.



Cat. No. 144—Curved
Splice Box with remov-
able cover.



Cat. No. 120—for PAR-
38 or GE-R40 200-watt
low price completely
enclosed wire unit.

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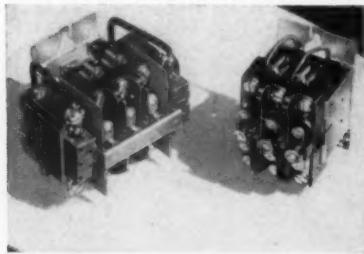
303 NORTH THIRD STREET • PHILADELPHIA, PA. • Manufacturers of Electrical Accessories for Home and Industry



Industrial Warning Light (7)

A new electric signal light for use as a warning device in industry to indicate hazardous work areas, or as a visual communications light in noisy shops, or over long distances. The new Beacon Ray 27-S light uses the principle of a colored light beam revolving horizontally in a 360-degree arc, producing 100 brilliant flashes per minute. It operates on 110-volt power. The light is applicable for use in steel mills, foundries, machine shops, as a crossing warning light for in-plant railroad installations, for signalling on long production lines, in lumbering, building and construction projects, on farms and ranches, in shipyards, and other permanent or temporary locations. Available with red, green, blue, amber and clear lenses.

Federal Sign and Signal Corp., 8700 South State St., Chicago 19, Ill.



Starters and Contactors (8)

A new line of magnetic, across-the-line starters and contactors designed specifically for the air conditioning and refrigeration industries. The operating mechanism is a special, designed-for-the-purpose control. To provide the special tripping characteristics required by hermetically sealed motors for protection against burnout, the controls can be equipped with Type "QT" quick trip heaters. These quick trip heaters and standard heaters both fit standard overload relays. Since the rating of 30 amperes at 300 volts max ac only covers all compressors of approximately 8 tons capacity, one size of control will cover practically all installation needs. Features include built-in straight-thru wiring; rugged contacts; construction de-

signed for greater efficiency and low wattage consumption, and new NEMA Type I enclosures with wrap-around cover of heavy gauge steel. Slotted mounting holes permit removal of unit from enclosure for maintenance.

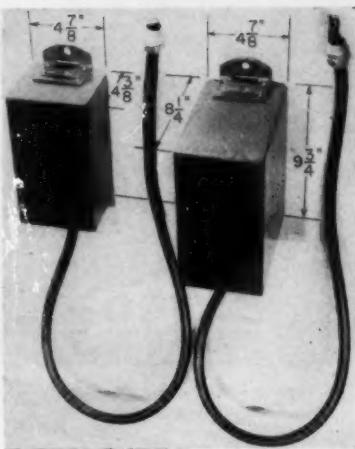
Arrow-Hart & Hegeman Electric Co., 103 Hawthorn St., Hartford 6, Conn.



Sealed Beam Fixture (9)

New weatherproof holders have been designed for a relatively narrow distribution of light from a compact source. Fixtures are wired at factory, and all wiring is completely enclosed. Receptacle arrangement enables lamp to be rotated for maximum efficiency. Protective lens with channeled rubber seal is fastened in hinged ring by two clips. Entire holder is adjusted to either vertical or horizontal positions, and easily locked in place. Cooling fins dissipate heat rapidly. Constructed of Alumalloy, the SSNB Series won't rust or corrode.

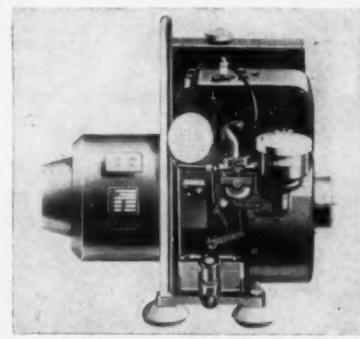
Killark Mfg. Co., Vandeventer & Easton Aves., St. Louis, Mo.



Capacitor (11)

A new line of weatherproof capacitors for outdoor or indoor application on 460-volt distribution systems is available. Compact design in a wide range of ratings makes it ideal for power factor improvement on isolated installations, such as oil field and irrigation pumping motors. When connected on load side of motor starter, there is no need for a separate switch. Aluminum-case construction provides permanent protection against corrosion or atmospheric conditions. A flexible cable allows installation by direct or conduit connection. All units are 3 phase, 460 volts. Smaller unit is rated at 2 and 3 kvar; larger at 4, 5 and 6 kvar.

Westinghouse Electric Corp., Box 2278, Pittsburgh 30, Pa.



Telemetering System (10)

New telemetering system designed for the automatic remote control of municipal and industrial water and sewage equipment. It is called Autocon "Telestep". It provides transmission for up to 30 control or continuous proportional signals in either direction between a transmitter and one or more receivers to span distances between outlying deep wells, reservoirs, treatment basins, elevated storage facilities and central control centers. It uses dc signals to reduce and eliminate inductive and capacitive effects in transmission lines. Telestep can be used with No. 26 wire or larger. Leased telephone wires or private cables are normally used. Signals can be sent automatically as required by the system to operate a number of devices, to report that they are on and to give alarm to alert operators of approaching dangerous conditions or malfunction.

Automatic Control Company, 995 University Ave., St. Paul 4, Minn.

Generator (12)

A new portable generator that puts out 1.7 kilowatts of power continuously has been introduced. Called Gen-A-Matic, it fits into car trunk or small pick-up truck. It features a special patented Magnematic ignition system for easy starting, and its moisture-proof construction and air-cooled, 4-cycle operation insures all-weather efficiency. Operating on 115 volts, dc, heavy-duty brush mounting gives low current density; hard-drawn copper commutator has V-ring construction and mica insulation is undercut to increase brush life; direct mounting on engine shaft or armature.

Multi-Matic Corporation, 14741 Besemer St., Van Nuys, Calif.

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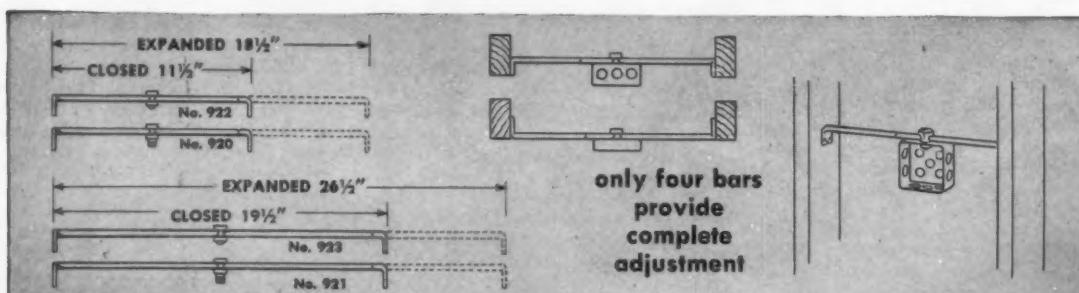
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fill every requirement...

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TO INSTALL ANY DEPTH BOX
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only four bars
provide
complete
adjustment

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1. Direct pull on stud
of 200 pounds for 5
minutes.

2. Six rotations of a
30 pound pull, 20°
away from stud at a 30°
angle in one minute.

3. A torque of 2.0
pounds at 20° hori-
zontally from stud for one
minute.

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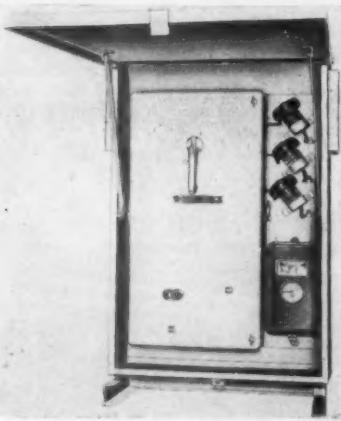


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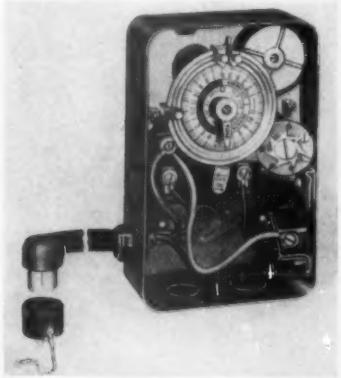
ALL-STEEL EQUIPMENT INC. Aurora • Illinois



Control (13)

A new line of both single phase and three phase "Noark" oil well pumping controls designed for across-the-line starting of squirrel cage motors used to drive oil well and other types of pumps. Control consists of across-the-line starter with overload protection, and a "Hand"—"Off"—"Auto" selector switch together with an undervoltage relay and a lightning arrestor. A motor-driven 24-hour time switch permits definite time operation of automatic pumping cycles. Disconnecting means and short circuit protection of starter, motor, and wiring on the load side are provided either by the "Noark" Type AB circuit breaker or Type A heavy-duty, front operated fusible safety switch. All equipment is mounted in a raintight enclosure on a removable steel back plate.

Federal Electric Products Co., 50 Paris St., Newark, N. J.



Time Switches (14)

Portable plug-in time switches designed especially for automatic control of room air conditioners. Known as Series P690, they will control automatically any $\frac{1}{2}$, $\frac{1}{4}$ or 1 hp room air conditioner. Switches are equipped with a 4-foot, 14 gauge, 3-wire, Type "S" cord set with moulded rubber, 3-way, grounded male plug. Two models are available. Model P691 is for 125-volt operation. Cord set is equipped with an adapter plug so it can be used on either a 2-wire or 3-wire system. A

3-way universal receptacle is mounted on right side of case. Model P692 is for 250-volt 3-wire. It has a standard 3-way receptacle. Series P690 incorporates the Inter-Matic "skipping" device which permits skipping the automatic operation of the time switch on Saturdays, Sundays, holidays or other selected days of the week. U. L. approved. Catalog NR14 is available.

International Register Co., 2624 W. Washington Blvd., Chicago 12, Ill.



Cable (15)

A new and improved non-metallic sheathed cable, known as Silver Triex. It comes in sizes 14/2 through 4/3. It has an outer covering of Glazon braid, which is based on a continuous filament glass yarn which cannot rot, burn, absorb moisture or deteriorate with age. Cable is small in diameter, tough and flexible. In addition Silver Triex is non-flaking, smoother, lighter and easy to strip. It has black printing on bright silver background.

Triangle Conduit & Cable Co., Inc., New Brunswick, N. J.



Instrument (16)

This portable field instrument measures dc current at voltages up to 40 kv when applied to the insulation of such equipment as generators, transformers, bushings, and cable. Advantages are: safety features, excellent output voltage regulation, simple operation, and compact design. Facilities for making voltage and current measurements at either polarity have been incorporated. The set has a current rating of 25 milliamperes at short circuit, and current measurements can be made down to 0.5 microamperes. All high voltage components are oil immersed. The overall dimensions are: 19 $\frac{1}{2}$ inches high, 13 $\frac{1}{2}$ inches wide, 20 inches deep. Bulletin 22-6 is available.

James G. Biddle Co., 1316 Arch St., Philadelphia 7, Pa.



Home Fire Alarm (17)

A new low-cost, easily installed fire alarm system designed especially for use in new home building construction. Always ready to give the alarm is a bell fitted flush into the wall of master bedroom or hallway in the living area. This bell is connected directly to thermal detectors, which are extremely sensitive to heat changes and set the alarm off to reveal a dangerous condition even before fire actually starts. A pushbutton is installed in the wall plate which permits testing the system at any time. The system provides two detector units, for furnace room and storage area, as standard equipment. Additional detector units are available and easily added to the system to protect any other "hazard" spot, no matter how remote. The alarm bell of this system is mounted and wired together with the transformer and test button on a sub-plate for mounting in a standard 3-gang sectional gem box. A 3-gang etched aluminum plate is provided to cover equipment in wall box and make a flush installation. Except for 115-volt supply, ac only, to the transformer, the system operates on 10-volt "bell transformer" current. For "surface" installation in existing homes a fully enclosed surface unit will be provided with a 12-inch cord and plug to plug into any 115-volt ac outlet. The detectors and wiring of this unit will be the same as that used for installation in new construction.

Edwards Company, Norwalk, Conn.



Lighting Fixture (18)

Ten luminaries designed for large commercial installations are known as the "Modernizer" group. Advantages include a tailored-looking installation when flush-mounted, easy installation and simplified maintenance. The V-spine provides a highly reflective surface, increasing down-light intensity. Eight 4-foot luminaries are available with two or four lamps, and two 8-foot units, with two and four lamps. Four lamp styles include: T-12 medium bi-pin, T-12 medium bi-pin instant start, T-12 rapid-start and T-12 slimline.

Mitchell Manufacturing Co., 2525 Clybourn Ave., Chicago, Ill.

15,000 TYPES, SIZES & RATINGS

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**INCREASE PRODUCTION...
DECREASE COSTS WITH THESE
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Use CHROMALOX Electric Heaters to heat liquids, air and gases. Use them to heat platens, dies, molds and moving metal parts. Use them anywhere you want fast, economical and easy-to-control heat for production line processing. CHROMALOX Heaters are simple to install, efficient, come in types, sizes and ratings for working temperatures up to 1100° F. Most are available from stock.

**FOR IDEAS ON HOW TO USE
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WRITE FOR THIS
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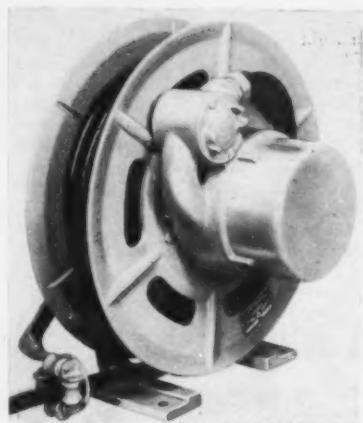


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Reel

(19)

A new explosion-proof Spring-O-Matic Powereel is available. The reel is designed for all cable sizes and is equipped with a ball-bearing spring retractable mechanism that handles most jobs such as on cranes, hoists, elevators, conveyors, portable electrical equipment, etc. It also has an adjustable cable guide in standard 4-roller or swivel type. The collector ring is specially designed for heavy duty oscillating operation. The reel is available with or without cable.

Industrial Electrical Works, 1509 Chicago St., Omaha 2, Neb.

Mercury Lamp

(20)

A 42% increase in light output of G.E.'s 400-watt color-improved reflector mercury lamp (H400-RC1) has been announced. The improvement steps up the lamp's light output from 2,300 lumens to 17,500 lumens. Increase in light output has been made possible by utilizing the fluorescent phosphor on the lamp's inner surface as the reflector and by eliminating the metallic coating. The newly designed mercury lamp provides well controlled downward light equivalent to that from the former RC1, and emits a considerable amount of upward light for redirection by an outside reflector.

General Electric Co., Nela Park, Cleveland 12, Ohio

Motor Relay

(21)

A new improved motor starting current relay for automatic control of starting winding circuits in single-phase, capacitor-start and split-phase induction motors features a variable magnetic phase shift within the relay coil to provide silent, snap-action contract operation with negligible ac chatter. The core set screw in the new unit carries a copper shading coil within a magnetic steel tube in the relay coil to provide the variable magnetic phase shift. This permits adjustment of the time lag difference between the two magnetic fluxes of the core set screw and tubing while being energized, allowing suppression of ac chatter and a broad

scope of sensitive adjustments for relay cycle operation at a variable current margin as low as a fraction of an ampere. Relays have constant operation over wide temperature range; are available in six coil sizes for motors from $\frac{1}{2}$ hp to 5 hp, 25 or 60 cycle.

Lewis Electric Company, 1254 West Harrison St., Chicago 7, Ill.



Switch and Starter

(22)

A selector switch and fractional horsepower manual starter in a single enclosure. The "Auto-Off-Hand" selector switch permits remote control from a thermostat, or local control from the starter. The manual starter provides motor overload protection. Two manual starters, without selector switch, are also available in the same enclosure. Maximum ratings are 1 hp at 115 or 230 volts single phase ac, or 115 or 230 volts dc. Bulletin 2510-A is available.

Square D Company, 4041 North Richards St., Milwaukee 12, Wis.



Thresher

(23)

Simpact 1-in. to 2-in. self-contained ratchet thresher is now offered with a new improved cam-type quick-action pipe holder. Holder has broader jaws to permit more positive grip on pipe, and free action cam that sets instantly to size. Quick and positive setting of Simpact high speed steel dies can be made to 4 pipe sizes, 1-in. to 2-in. Simplicity of design has reduced moving parts in this tool.

Toledo Pipe Threading Machine Co., Toledo, Ohio

Wanna buy a bell?

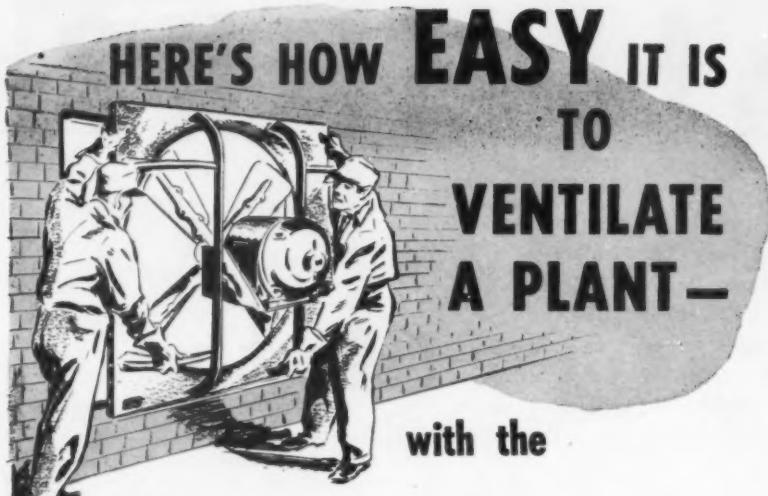
When you do, come to Auth . . . and buy buzzers, chimes, horns and sirens too. A complete variety is available, from midget buzzers that whisper "Come in, Miss Smith", to giant gongs that clang "FIRE! Get out!". They're easy to install and provide rugged, trouble-free operation with a minimum of maintenance. Get your copy of handy Audible Signals Catalog No. 105 by writing to: *Auth Electric Company, Inc., Long Island City 1, N. Y.*



Manufacturers of
audible signals,

push buttons, annunciations, transformers,
telephones, mail boxes, and complete signaling systems for
hospitals, housing, schools and industry.





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TO VENTILATE A PLANT—
with the
BIG new line of husky
"BUFFALO"
PACKAGE
PROPELLER FANS**

1. To determine the fan capacity required, calculate the total cubical contents of the space to be ventilated (in cubic feet) and divide by the rate of air change recommended or desired. Result will be cubic feet per minute, corresponding to fan ratings. (I.e. A 150,000 cu. ft. factory area with an air change every three minutes would require our fan rated 50,000 CFM or say three fans each rated 16,700 CFM)

2. Pick the attractively priced "Buffalo" Propeller Fan each area calls for. You can get 'em in sizes from 8" to 120" handling from 500 to 250,000 cfm. Then get prices and figure the job.

3. Install. And whether it's new construction or old, here's where you'll appreciate "Buffalo" Fans! Make square opening in wall to fit the sturdy "Buffalo" square panel one-piece welded assembly. Panel has pierced flanges for easy fastening to steel, masonry or wood with bolts, studs or screws. Your installation labor and time are small. Your customer is pleased with the low cost of the job, and even more pleased at the ventilation job these husky packages can do.

WRITE FOR DETAILS TODAY!



If you're after a really wide line of fans that are easy to sell, easy to install and satisfactory on the job, have us mail you details on the whole "Buffalo" package propeller fan line. You'll find fans for high temperatures and/or corrosive fumes—fans for any-angle discharge—fans to operate against as high as 1" s.p.—popular attic fans—complete choice of louvers, and so on. Write today!

BUFFALO FORGE COMPANY

520 BROADWAY

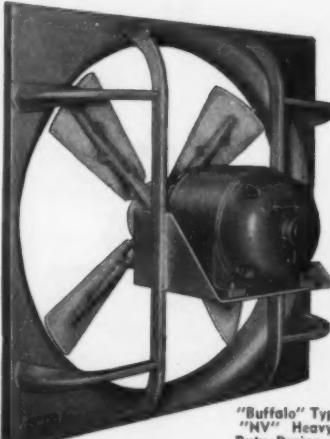
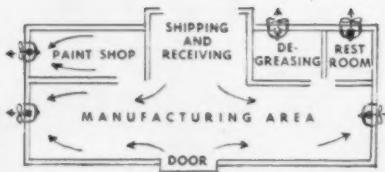
PUBLISHERS OF "FAN ENGINEERING" HANDBOOK
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

Design A NV-Breezo Fans
Breez-Air Attic Fans

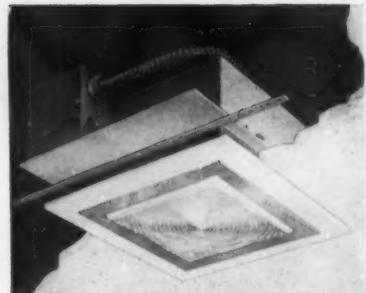
Belted Vent Sets
"L" Breezo Fans

Design 53 Belt Air Fans
Baby Vent Sets

160 ELECTRICAL CONSTRUCTION AND MAINTENANCE . . . JULY, 1954



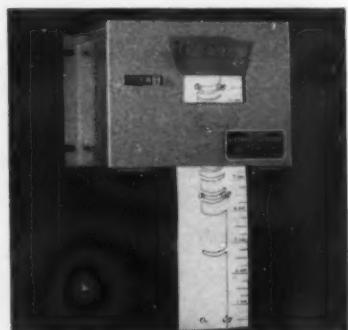
"Buffalo" Type
"NV" Heavy-
Duty Design 80
Propeller Fan.



Lighting Unit (24)

A new shallow recessed lens incandescent lighting unit, known as Advanced Elliptisquare. Regardless of ceiling construction, units are adaptable for rapid installation. Clear prismatic Amcolens allows lighted objects to reflect true color values. Amcolens projects below face trim to provide edge-light on surrounding ceiling for contrast relief. Elliptisquare multiplies light output by redirecting all box enclosed lamplight downward. It uses horizontal lamp of 100, 150, 200 or 300 watts. Reflector has specular aluminum reflecting surface. Insert box, face trim and hinged door are one-piece stampings of steel and are processed to resist rust. Vertical slotted mounting holes in insert box provide adjustment for ceiling thicknesses from $\frac{1}{2}$ in. to 2 in. Approved by Underwriters' Laboratories, Inc. Bulletin 254 is available.

The Art Metal Company, 1814 East 40th Street, Cleveland 3, Ohio

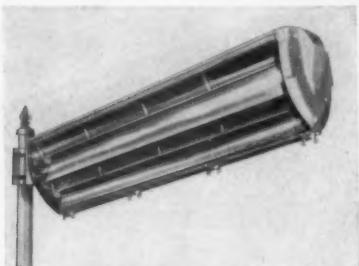


Instruments (25)

The Time-Recorder-Totalizer or the Time-Totalizer simplifies the checking of any process, equipment and operating personnel. The Time-Recorder-Totalizer is ideal for use by anyone wanting to have an uninterrupted record of when and how his equipment is used. On a continuous tape, a permanent record shows chronologically when the process or equipment is on or off. It highlights defects in the process, equipment or automatic control adjustment used in the system. It records the operation of any process or machine whether operated automatically or manually. The time totalizer serves as a reference to determine when the system and its

components need cleaning, repair, overhaul or replacement. The Time-Totalizer can be mounted or connected to any electrically operated equipment. Like an adding machine, it automatically totals the operating time of the equipment, providing a ready reference for determination of overall efficiency of production and equipment.

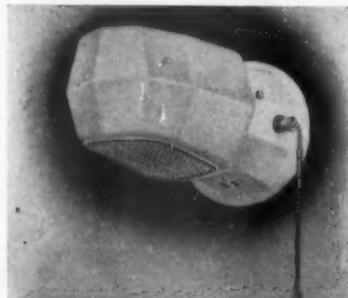
Heat-Timer Corporation, 657 Broadway, New York 12, N. Y.



Fluorescent Unit (26)

A new four-lamp fluorescent luminaire for street lighting systems. It is designed for mounting at 25 feet or higher, accommodates latest approved 6-foot street lighting lamps and approaches a Type III or Type IV distribution pattern. All metallic parts are cast or sheet aluminum, while covers are translucent plastic. Hinged at top and latched at bottom, covers facilitate easy relamping and maintenance. Gaskets make unit weatherproof and bug-proof. A mounting bracket permits easy installation and incorporates a plus or minus 5° leveling feature. It also enables luminaire to be tilted up to 20° from horizontal so that balance between building front and road surface lighting may be changed.

Line Material Co., Milwaukee 1, Wis.



Lighting Fixture (27)

This new type of lighting fixture has an enclosing glass shade, inside of which there are two lamps. One lamp can be 100 watts or smaller, for general illumination; the other lamp a small 6-watt night-light lamp. There is a two circuit pull switch, making it possible to operate either lamp alone. The light from the night-light is sufficient to softly illuminate the room. Unit is ideal for the bathroom, nursery, and other locations where a night-light is desired.

Pass & Seymour, Inc., Syracuse, N. Y.



QUAD LIGHTING YOU SELL CUSTOMER SATISFACTION

Wide Field for Sales

In many plants there are sections where it is only possible to obtain satisfactory lighting by mounting reflectors considerably above the usual mounting heights. Here then is opportunity for reflector sales in addition to the QUAD types you sell for normal installations.

QUAD High Mounting Reflectors are made in two sizes and designed for use with General Service incandescent lamps 300 watt to 1500 watt inclusive and 400 watt Mercury lamps.



QUAD

RLM HIGH MOUNTING REFLECTORS

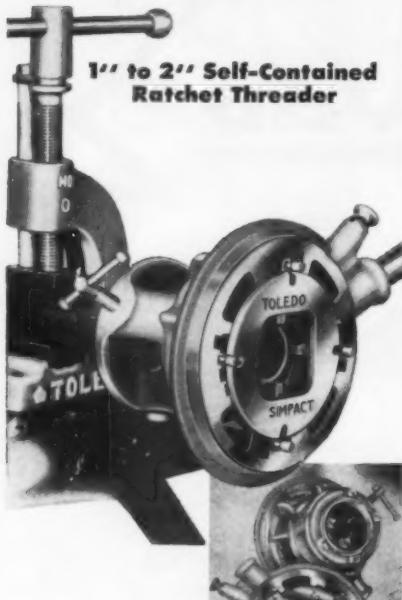
Particularly Adapted for use in Industrial Plants

This type reflector is entirely weatherproof making it possible for you to get sales for outdoor installations as well as indoor. Made in solid neck socket-type reflector style as shown or equipped with QD interchangeable socket-fitting for mounting on vertical or horizontal pipe supports.

Gymnasiums offer another source for sales.

QUADRANGLE MFG. CO.
325. PEORIA ST. CHICAGO 7, ILL.

NEW Improved TOLEDO Simpact



WITH
CAM-TYPE
PIPE HOLDER

- ★ Improved cam-type quick-action pipe holder has broader jaws for more positive grip on pipe.
- ★ Free action cam assures instant setting to any size—1" to 2".
- ★ Easy to center . . . you get perfect aligned threads.
- ★ Fewer moving parts . . . minimum wear . . . light in weight. Amazingly compact . . . will thread a pipe projecting through a wall as short as 6 1/4".
- ★ Accuracy proven through the years . . . dies recede along tapered steps. A fine quality tool—yet low in cost! Write for new catalog. Order through your supply house. The Toledo Pipe Threading Machine Co., Toledo, Ohio. New York Office: 165 Broadway, Room 1310.

RELY ON THE LEADER!

TOLEDO
PIPE TOOLS...POWER PIPE MACHINES...POWER DRIVES



Trolleys

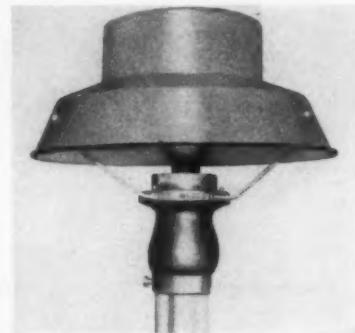
(28)

Four new 20-ampere special service trolleys, designed for application of the Feedrail "60" trolley busway electrification system are available. They are available in fusible and non-fusible types, in 2 or 3 poles. Identical chassis—insulator—contact assemblies are used in these trolleys. A polarizing tube on the chassis prevents insertion of the trolley in the track in improper polarity. Set in the chassis is a one-piece insulator block. Replaceable copper graphite brush contacts, with two individually spring loaded contracts per pole, are specially designed for continuous movement applications requiring up to 250 feet per minute travel. A heavy gauge sheet steel terminal box, with removable cover, serves to enclose solderless type pressure connectors of the terminal block. Bulletin No. 36 is available.

Feedrail Corporation, 125 Barclay St., New York 7, N. Y.

tion. Unit has articulated weatherproof adjusting arm for universal aiming. Mounting arm is threaded $\frac{1}{2}$ -inch to fit cluster and unit mountings. Unit has fully-enclosed wiring; is available with or without clear, heat resisting lens; is ideally suited for general and pin-point floodlighting of buildings, memorials, churches, etc.; in clusters is highly efficient for protective lighting.

Afco-Lite Corporation, 1234 N. Paulina Street, Chicago 22, Ill.

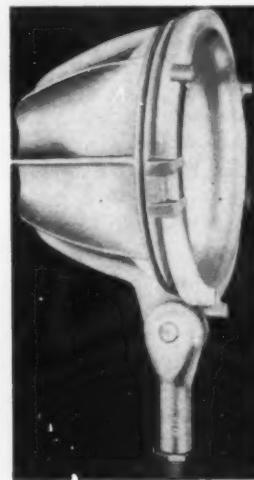


Island Lights

(30)

Island lights for use in recreation areas with 24 gauge steel, porcelain vitreous enamel (corrosion resistant) reflector, 16-inch in diameter. Unit is available in red, green, blue and white. Medium base lamp burns base down and entire unit slips on to a 1 1/2-in. or 2-in. pipe.

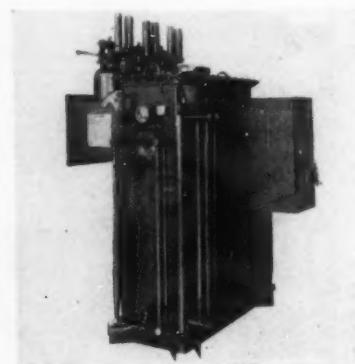
Magni Flood, Inc., 38 North Second Ave., Mt. Vernon, N. Y.



Floodlight Housing

(29)

A new cast aluminum housing No. 1000 for the 300-watt, 80,000 candlepower, PAR 56 sealed beam lamp, features a side-mounted, heavy, overlapping, hinged lens-rim for easy relamping. A single brass, knurled-head, thumb screw keeps the rim tight against the lamp. Beam of lamp can be changed from long oval to wide oval by rotating rim-held lamp 100°. Guide bosses on lamp and slots in rim assure alignment in either position. Cooling fins on aluminum housing dissipate heat and assure cooler lamp opera-

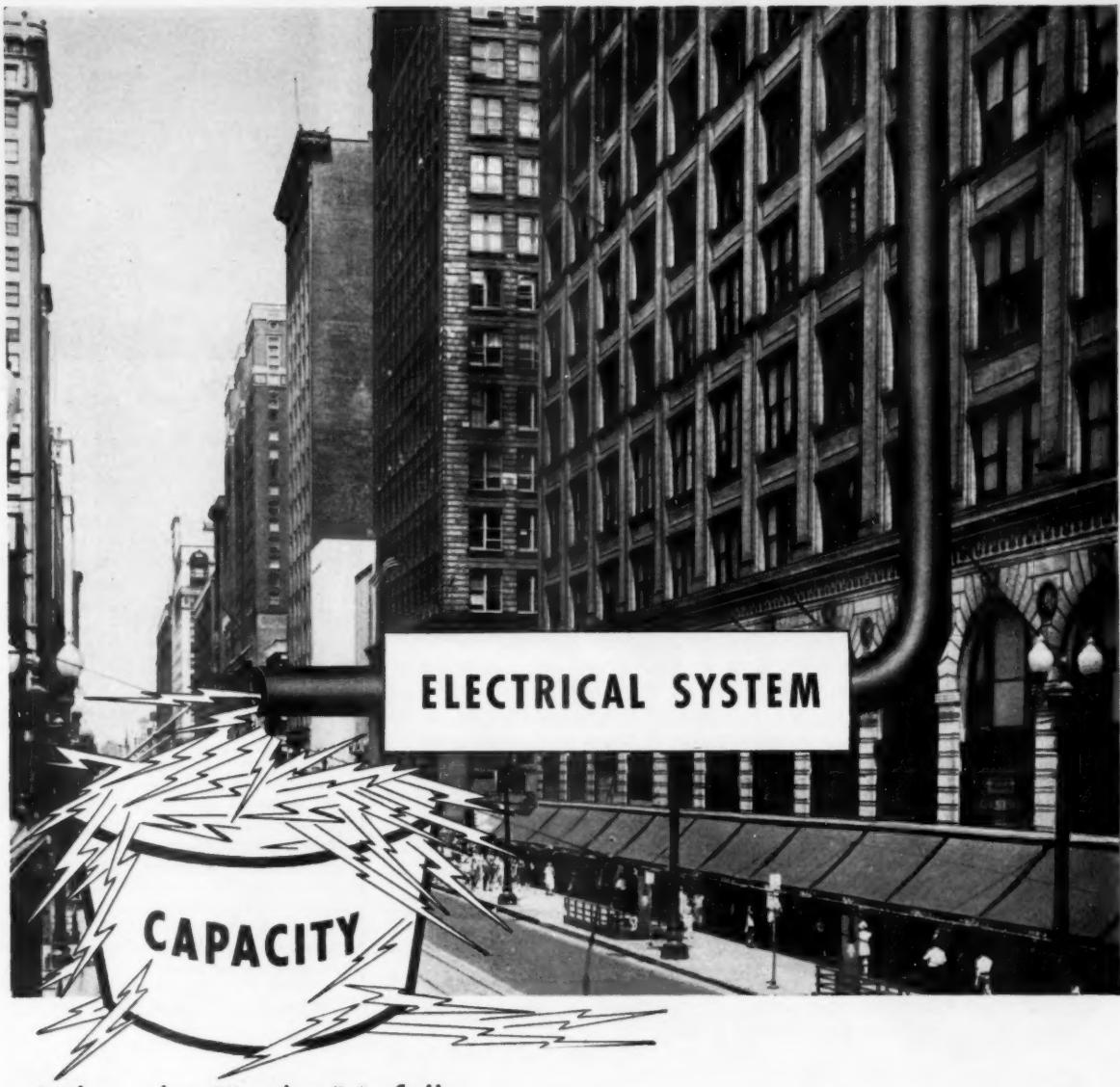


Transformer

(31)

A unit substation, or load, center transformer, can effect many economies in installation and operation of the distribution system. High voltage fused cutouts or switches plus low voltage circuit breakers or switches from integral parts are usually supplied in accordance with the purchaser's requirements. A complete range of sizes through 10,000 kva and voltages through 72 kv is available. Units are designed for either indoor or outdoor installation and may be liquid filled or dry type.

Standard Transformer Co., Warren, Ohio



When the "Bucket" is full

HOW DO YOU GET CAPACITY FOR AIR CONDITIONING LOADS?

ANSWER: Increase your "Bucket" capacity 30 to 50% by replacing your Wire and Cable with ROCKBESTOS A. V. C.® (N. E. C. Type AVA) without changing conduit!



STOCKED
COAST TO COAST

Standard Rockbestos A.V.C. (N.E.C. types AVA, AVB, etc.) are available from stock for immediate shipment. Call or write nearest branch office.



ROCKBESTOS PRODUCTS CORP.
NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO
PITTSBURGH • ST. LOUIS • LOS ANGELES • NEW ORLEANS
OAKLAND, CALIFORNIA • SEATTLE

You can't beat Black & Decker *Power* for Speeding Jobs and Saving Money!



DON'T waste valuable time struggling with old-fashioned hand tools when you have a hole to drill! Switch to Black & Decker power and see how much time (and money) you actually save on every job!

Take the B&D $\frac{1}{2}$ " Standard Drill, for example. You just can't beat it for general-purpose use on all your jobs! It drives twist drills, Hole-Saws and wood augers for drilling joists and steel boxes; installing switch boxes, cut-outs and switch boards; cutting through switch and terminal boxes in BX work; deep boring in heavy timber and planking. With carbide-tipped drills, it goes through brick, cement and cinder block walls. And a special right angle attachment makes drilling in tight places a cinch.

See your nearby Black & Decker Distributor for a demonstration. Write for a FREE, detailed catalog to: THE BLACK & DECKER MFG. CO., 617 Pennsylvania Ave., Towson 4, Md.



B&D Right Angle Attachment is perfect for close-quarter work, like reaching out-of-the-way places on joists. Transmits full power; maintains correct spindle speed. Attaches to B&D $\frac{1}{2}$ " Standard and larger drills.



B&D Hole-Saws cut clean, round holes faster—in wood, steel, plastics, board, alloys. Perfect for cutting through switch and terminal boxes. Fine-tooth and coarse-tooth styles in sizes from $\frac{1}{2}$ " to 4" diam.; mandrels to fit all electric drills.



B&D Masonry (Carbide-Tipped) Bits go through brick, cement, cinder block and similar materials much faster than a star drill, and the hole size is maintained more accurately. Easily sharpened without reducing cutting diameter.

Get more details about Portable Electric Saws, Hammers and other Black & Decker Tools from McGraw-Hill's Electrical Catalog.



For nearest distributor,
see "TOOLS-ELECTRIC"



Black & Decker
PORTABLE ELECTRIC TOOLS



Junction Box

(32)

New GRH Series explosion-proof junction boxes are available in sizes up to 11-in. by 12-in. by 7 $\frac{1}{2}$ -in. Cover opening measures 9 $\frac{1}{2}$ -in. in diameter. The GRH Series take conduit hubs from $\frac{1}{2}$ -in. to 4-in. and these can be drilled and tapped in any position desired. Boxes can be mounted either vertically or horizontally. Straps are included for this purpose. They are UL approved.

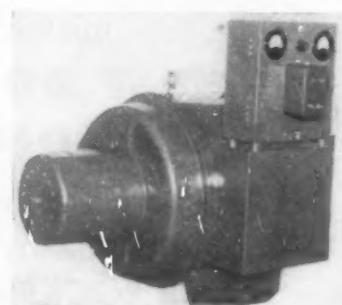
Killark Mfg. Co., Easton & Vandeventer Aves., St. Louis, Mo.

Louver-Diffuser

(33)

The Grate Lite Louver-Diffuser is now available in two sizes: 16 inches wide by 48 inches long and 11 inches wide by 48 inches long. The larger Grate Lite will make possible the use of fewer panels in complete ceiling-type installations and will also be used in the new 16-inch wide fixtures now being introduced by Guth. Grate Lite is a plastic grid with $\frac{1}{4}$ -in. cubical openings which give it the appearance of a white lattice.

Edwin F. Guth Company, 2615 Washington Ave., St. Louis 3, Mo.



Generators

(34)

A new series of revolving field type ac generators, with frames of fabricated steel construction, oversize ball bearings and equipped with cast iron endbells and direct connected excitors. Available in 1800 rpm, 4-pole, 3-phase, 60 cycle from 208 to 600 volts, in sizes from 60 to 150 kw. Also available in single phase, 115/230 volts from 40 to 100 kw. The new series

also includes 1200 rpm, 6-pole, 60 cycle, 3-phase models in sizes 40 to 100 kw and 30 to 60 kw, single phase. Generators can be had in either two bearing construction or single bearing for direct engine adaptation. Generators will maintain a voltage regulation of plus or minus 2½% with an automatic voltage regulator. They are of Class A insulation with temperature rise less than 50°C by resistance or 40°C by thermometer except on the 100 kw, 1200 rpm size which is 52°C to 53°C rise by resistance. Bulletin is available.

Katolight Corp., Mankato, Minn.



Battery Charger (35)

A new industrial type battery charger for emergency generator sets as well as for general industrial usage. When used with electric plant starting batteries, its purpose is to keep the starting battery of the emergency set at the properly charged level. Features include: range of charging 0.05 to 2.0 amps; infinite screw driver adjustment over this range; indicating built-in charging rate meter; input voltages 120 to 600; output voltages 6 to 32 dc; 12 different combinations of input and output voltages.

Automatic Switch Co., Orange, N. J.

Aluminum Posts, Lanterns (36)

A new line of all aluminum posts and cast aluminum lanterns are available. They are styled with sign plaques, arrow ladder-rest assemblies and side-arm lantern mountings. The entire line consists of 12 post selections and 7 lantern models. All parts and units are finished in special exterior enamel in black or white.

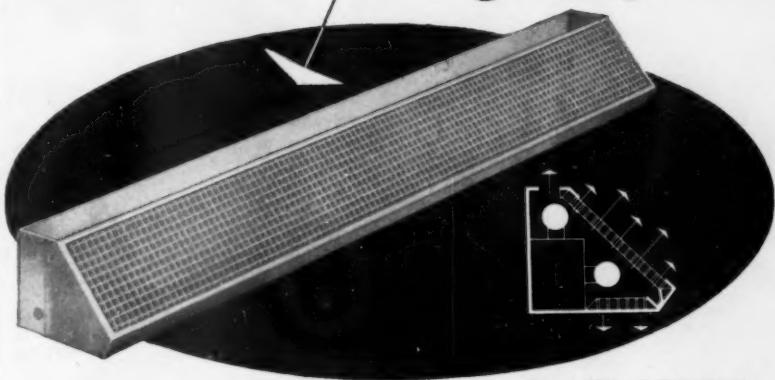
Hadco Aluminum Products Co., 501 Pressley St., Pittsburgh 12, Pa.

Controllers (37)

New explosion-proof control units are cased in cast steel housings with standard approved conduit fittings. A glass panel permits viewing of dials and indicators, while a built-in motor allows setting of controls from a remote, explosion-proof switch. All controllers, indicators and recorders are available in such housings for use in atmospheres of explosive or highly corrosive fumes.

Industrial Instruments, Inc., 89 Commerce Road, Cedar Grove, N. J.

*a brand new slant
on cove lighting*



GUTH GRATELITE* **LUMINOUS COVE**

(the 2-in-1 bracket) (TM Pats. Pend.)

An exciting new look. Sparkling-like a superb diamond! Classic beauty and workmanship in the Guth tradition.

It's the new fashion in Cove lighting made possible by GRATELITE: low brightness, high efficiency, excellent diffusion, low upkeep.

beams 80% of light directly upward and outward!
beams 20% of light downward to brighten side walls!
perfect shielding in 45° x 90° zones by GrateLite!



as luminous indirect cove



in fitting room



in barber shops



over hospital bed

Write on your letterhead today for Bulletin 929-A.

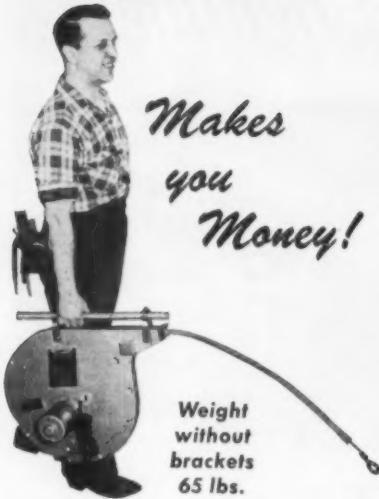
*U. S. & Can. Pats. Pend. TM Reg.

Guth

THE EDWIN F. GUTH CO. • ST. LOUIS 3, MO.

Leaders in Lighting since 1902

THE ONLY COMPLETE
**WIRE-PULLING
POWER TOOL**



*Makes
you
Money!*

**ONLY ONE SETUP
IS NEEDED!**

PUSHES 45 Ft. of fish tape per min.
PUSHES around five 90° bends.
STOPS automatically if obstructed.
PUSHES 175 Ft. of .060" x ¼" usable highest quality tape.
MAY BE USED in any position.
INDICATOR shows how many feet of tape is pushed into conduit.

★ ★ *

PULLS 17 Ft. per minute, full load.
PULLS 1200 Lbs. (equals pull of 8 men).
PULLS wire in ¾" to 2" conduit.
OPERATES on 115 Volt AC or DC Current.
RUGGED, Heavy Duty Construction.

★ ★ *

SAFE! The fish tape is always in the conduit or in the tool . . . never free to come in contact with moving machinery, bus bars, live wires, etc.

AVAILABLE THRU YOUR NEAREST General Electric Supply Co.
Graybar Electric Co.
Westinghouse Electric Supply Co.

The **BARTH**
CORPORATION
12652 BROOK PARK RD., CLEVELAND 29, O.



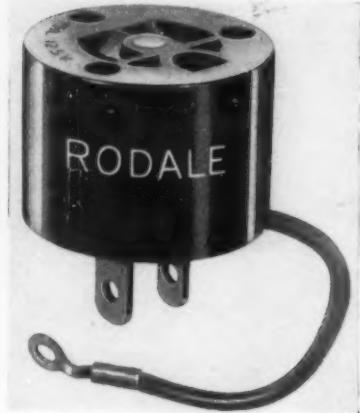
Outlet Boxes (38)

New 4-in. square outlet boxes with ½-, ¾-in. or combination ½- and ¾-in. knock-outs. Specially designed knockout dies assure fast, free removal, although knock-outs are securely attached and require a force of 20 p.s.i. to be removed. Boxes are stamped from 13 gauge code steel. Two holes are tapped on each ear for extra convenience during installation. Romex or clamps are assembled to boxes. Boxes are available in galvanized or painted aluminum metallic finish. Catalog is available.

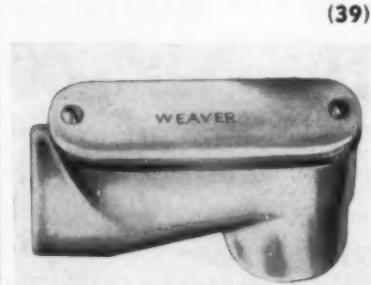
Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.

Reset can be either automatic or manual. Can be used with or without Lumenite level controls or time switches. All parts are nickel plated and stainless steel with copper reset springs. Overall size for 3 circuits is 6-in. by 7-in. by 3-in.

Lumenite Electronic Co., 407 South Dearborn St., Chicago 5, Ill.



Adapter (41)



ELBOWS designed to go with Weaver's "Dual-Grip" entrance heads, which have a built-in connector clamp for installation on either EMT or rigid conduit,—and Weaver's bronze ground clamps, which are made in sizes for ¼-in. to 4-in. pipe. Manufactured by J. A. Weaver Company, St. Louis 6, Mo.



Rectifier Units (42)

A complete line of variable voltage rectifier units which eliminate the need for variable speed pulleys, drives, belts, etc. There are two types: those with single-phase input from ½ hp to 3 hp; and 3-phase input from ½ to 75 hp. These manually-operated, self-contained units convert any ordinary dc motor into a variable speed motor from zero rpm to rated speed or above. The smaller, single-phase units can be plugged into any ac outlet and have reversing switches as part of the control. A single knob controls the speeds on all units. Known as variable voltage selenifiers, they are available for either 50-60 cycle input at any input voltage, and dc output voltages of 115, 230, 250 or 440. The Selenifiers are completely self-protected, and have a pilot light indicating that the rectifier is "on". All units can be made for remote control by pushbutton.

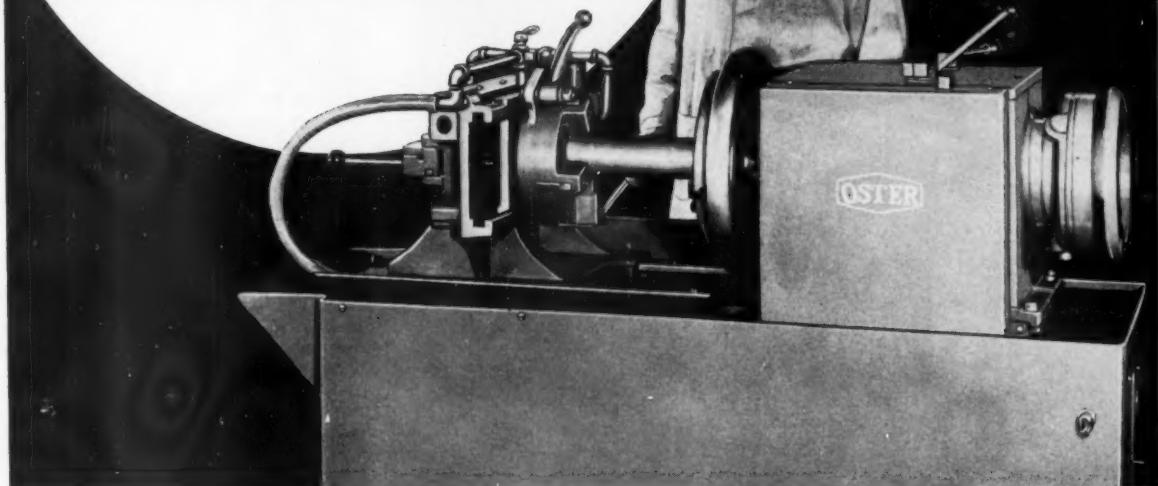
American Rectifier Corp., 95 Lafayette St., New York 13, N. Y.

Relay (40)

A newly-designed impulse multi-circuit relay is designed to control action of pumps, blowers, automatic processing, etc. Sequence of operations is usually factory set, but variations are simple and easily made. Can be set for No. 1 operation On—then Off; then No. 2 On and then Off and so on, with intervals or length of operation any length desired from 5 seconds up.



Thrift Model
with Wrenchless Chucks
SPEEDS UP
CONDUIT THREADING



Catalog No. 784

Threading is fast and accurate, no matter what the conduit length, when you use the Oster "Thrift Model". Rear-centering chuck gives maximum support . . . prevents whipping . . . is quick-acting and non-binding. Front chuck is ideal for frequent conduit size changes because a spin of the handwheel runs the gripping jaws through the entire range in a few seconds. Standard range of 1" to 4" conduit; extra range, $\frac{1}{2}$ " and $\frac{3}{4}$ ". Two quick-opening, de-

tachable, lever-operated die heads cover the entire range . . . lock dies positively . . . adjust all dies simultaneously for over and undersize threading.

The Oster "Thrift Model" is quality built for tough jobs, yet it's priced much lower than any other machine of equal range. For a free, factual booklet about the No. 784 "Thrift Model", write us today, or better still, contact your Oster Distributor.

THE **OSTER** MANUFACTURING CO.
Main Office and Factory:
2081 East 61st St., Cleveland 3, Ohio

Builders of Cost Reducing Threading Equipment Since 1893

BRONCO

40

*always tops
in its class...*

now jacketed with
**40% RUBBER
BY WEIGHT**
and is so branded!



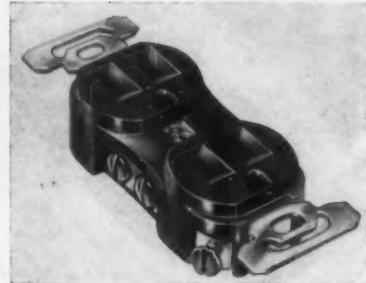
BRONCO 40 is recommended for inside, non-oily locations. Where severe conditions are encountered and maximum protection is required, the cord and cable to specify is BRONCO 40 CERTIFIED with 60% by weight Neoprene branded jacket.

The only 40%
rubber-jacketed
portable cord
with branded jacket.
And it is self-
measuring, too—
branding is
repeated every
two feet!



SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS

Manufactured by WESTERN INSULATED WIRE CO., Los Angeles 38 • California



Receptacle

(43)

New duplex 3-wire receptacle eliminates danger of shocks by grounding. Equipped with an easily identified, green-colored hex head grounding terminal, the outlet assures positive protection against this hazard. Outlet receptacle is molded of high-dielectric Bakelite in either brown or ivory. Features include heavy spring-bronze, double-wipe contacts and solid brass terminals with screw heads capable of holding two No. 10 wires securely. Designed for side wiring, with either BX or Romex. Rated at 15 amps, 125 volts or 10 amps, 250 volts. Listed by Underwriters' Laboratories. Accepts both standard caps and 3-wire grounded caps. Also available mounted on standard 4-inch metal cover.

John I. Paulding, Inc., New Bedford, Mass.

Ballast

(44)

A new fluorescent lamp ballast which features a "D" sound rating, for the guidance of fluorescent lighting users. Other installation factors being equal, the improved rating permits use of the ballast in locations with critical sound level restrictions, such as schools and hospital. Designed for series operation of two 96T12 slimline fluorescent lamps at 425 ma, the new ballast is rated at 110-125 volts, 60 cycles, with a line current of 1.55 amps.

General Electric Co., Schenectady 5, N. Y.

Time Switch

(45)

3700 Series time switch has been designed to provide automatic control for all makes of window air conditioners. The 7-day dial allows for different settings for each day as well as Sunday and holiday cutout. Switch can also be manually operated without disturbing the sequence of automatic operation. Two dials, which can be readjusted at any time, control the On-Off schedule. The On time is adjustable on a 24-hour dial, within 15-minute periods. The Off time is set on the 7-day dial and may be set to shut off air conditioner at a different hour each day. Suitable for use on air conditioning units up to and including 1-ton capacity.

Paragon Electric Company, Two Rivers, Wis.

Clamps

(46)

New ground clamps are available in three sizes— $\frac{1}{4}$ -in., $\frac{1}{2}$ -in. and $\frac{3}{4}$ -in. They are designed to give high pressure contact in a wide variety of standard applications. They are cataloged as GC Type ground clamp for parallel cable connection to rod or pipe. Bodies are made of cast bronze alloy, and square bolts are silicon bronze. They are designed to withstand Mercurous Nitrate Specifications ASTM B-154-51 and ABW 124-2.

Anderson Brass Works, Inc., Birmingham, Ala.

Battery

(47)

Flashlight battery "Eveready" D99 incorporates an entirely new principle of flashlight cell construction. The four zinc vanes are now on the inside, and the carbon-lined casing, which cannot corrode, is now on the outside. The burning up of the zinc "fuel" goes on inside the cell while the inert carbon wall on the outside keeps the battery sealed even when the zinc is consumed and the battery is exhausted. This construction results in a leakproof battery.

National Carbon Company, 30 East 42d Street, New York 17, N. Y.

Instrument

(48)

A new type of Wheatstone bridge which is called the Type ZK single knob measuring bridge, which covers six resistance ranges from 40 milliohms to 50,000 ohms, operated by a standard type 4.5-volt dry cell battery. In this type of bridge, only one button has to be turned, clockwise to increase resistance, counter-clockwise to decrease resistance, and the various ranges will click in automatically, and when the galvanometer pointer is balanced to zero, resistances are read off directly in ohms and milliohms from the figured scale. It comes in a bakelite case, with a leather carrying case. Bulletin No. 630 is available.

Herman H. Sticht Co., Inc., 27 Park Place, New York 7, N. Y.

Transformers

(49)

This line of boost and buck transformers provides the required voltage for air conditioning installation. It increases the 208 voltage to closely parallel the requirements of the 230-volt motor. Units are essentially 4 winding insulated transformers in which the separate windings are interconnected so as to provide essentially the same voltage tapping characteristics as an auto transformer. In effect the secondary winding voltage is added to the input voltage, thus boosting the output voltage 5% or 10% as desired. In addition, the load capacity of the transformer is compounded in relation to its multiplied output voltage.

Acme Electric, Cuba, N. Y.

BRONCO
Certified 60

tops every class!

*you know what
you are getting...*

CERTIFIED - 60% NEOPRENE BY WEIGHT

Proof of contents is branded into the jacket every two feet — "BRONCO 60 CERTIFIED — 60% NEOPRENE BY WEIGHT..." followed by the type, size, number of conductors, rated voltage, and "P1163M" ... U. S. and Pennsylvania Bureau of Mines approval number.

Why take less than 60% Neoprene by weight?

SOLD NATIONALLY BY ELECTRICAL WHOLESALE DISTRIBUTORS

Manufactured by WESTERN INSULATED WIRE CO., Los Angeles 50 - California



Service-Master

THE IDEAL ELECTRICAL CONTRACTING AND MAINTENANCE BODY

Here's the body that takes a completely equipped shop to the job, and saves up to 75 minutes per day. Using the latest average service base rate of 6 cents a minute and an average saving of 30 minutes a day . . . Service-Master saves \$478.00 worth of time a year. Available in sizes for $\frac{1}{2}$, $\frac{3}{4}$, 1, and $1\frac{1}{2}$ ton chassis—regardless of age or make. The coupon below will bring complete details, with no obligation to you.

MAKE YOUR PICK-UP TRUCK A SERVICE TRUCK, TOO!

SERVICE-TWINS

for $\frac{1}{2}$ and $\frac{3}{4}$ ton pick-up trucks



These easy-to-install tool and material compartments are finished in baked-on, medium-dark green enamel. Parts bins are built-in. Doors have slam-action catches, with locks keyed alike. Available with overhead rack.

MCCABE-POWERS AUTO BODY CO. 5900 No. Broadway • St. Louis 15, Mo.

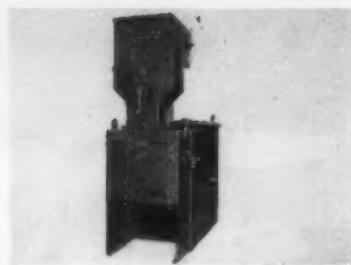
Please send me complete details on:
SERVICE-MASTER SERVICE-TWINS

Name _____

Company _____

Address _____

City & State _____ SE _____



Starters

(50)

A new line of Class I Group D motor starters designed for use where hazardous atmospheres and severe corrosive service conditions are encountered. Starters are of Valimotor (volt-ampere-limiter) type and provide over-all short circuit protection for 2200-5000-volt motors, irrespective of the fault or of the available capacity. Motor starters are suitable for use with high inrush motors. Other features include main line disconnect, minimum floor space requirements, and ease of accessibility to facilitate maintenance. Literature is available.

Electric Controller & Mfg. Co., 2720 East 79th St., Cleveland 4, Ohio.

Cutter

(51)

An adjustable slot insulation creaser and cutter combined in one machine, known as Lenni 2 in 1 cutter. Cutters are made in two standard sizes, 5 inches and 9 inches. The 5-in. cutter will work for motors up to 15 hp. The 9-inch will make insulators for over 99% of all electric motors. Super 51 cuffed rolls are available in individual dispenser. All rolls are wound on 4 $\frac{1}{2}$ -in. mandrels. Any width from $\frac{1}{2}$ -in. to 8-in. between cuffs can be supplied.

Insulation and Wires Incorporated, 1534 Swinney Ave., Fort Wayne, Ind.

Insulating Tape

(52)

Bi-Seal, self-bonding insulating tape, is now available in seven colors—black, white, red, yellow, orange, green and blue. This new series is designed for interior use where color identification of lead wires is important. Made of polyethylene based compound. When applied, it fuses into a solid mass that creates a tight permanent seal over the splice. It retains its flexibility at temperatures as low as minus 67°F.

Bishop Manufacturing Corp., 2 Canfield Road, Cedar Grove, N. J.

Call Systems

(53)

The redesigned "Vokalcall" audio-visual nurses' call system is for installation in hospitals in the process of renovating, as well as new hospitals. The new equipment permits the use of reduced wire sizes enabling contractors to string more circuits in existing conduit facilities or use smaller piping on new jobs. Another feature is the new plug-in receptacle.

All speaker-equipped calling stations are supplied with a multi-point jack receptacle. The installer connects the system wiring to the jack receptacle while the internal wiring of the unit is factory-connected to a multi-point plug. Bulletin No. 170-C is available.

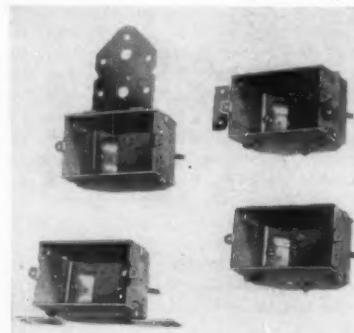
Auth Electric Co., 34-20 45th St., Long Island City 1, N. Y.

Flood Lamps

(54)

A new line of color-flood R-40 lamps designed for decorative illumination indoors and outdoors has been introduced. They are designed for dramatic and atmospheric lighting of theatres, drive-ins, motels, amusement parks, and commercial, industrial and holiday illumination. Five basic colors, blue, green, yellow, red and amber, can be used singly or in combination. The yellow lamp is also used as an insect repellent outdoors and indoors. Ceramic colors are fused permanently into the glass. Bulbs are of hard glass to resist cracking due to rain or snow. A silver reflector is sealed inside. Base is attached with special high-temperature cement and nickel-plated to prevent corrosion or "freezing" in the socket. Two sizes of lamps, 150- and 200-watt, are available in each color. Bulletin 34 is available:

Radiant Lamp Corporation, 300 Jelliff Ave., Newark 8, N. J.



Switch Boxes

(55)

A complete line of sectional switch boxes are available in a variety of styles, with clamping, mounting and knockout arrangements to cope with any installation problems likely to be encountered. They are furnished with or without plaster ears, "RX" clamps for non-metallic flexible tubing and sheathed cable, "leveling bumps", and mounting brackets for either side or face mounting to studs. Design features include: clamps with nested fit; knockouts and "pri-outs" specially designed; screw adjustment on plaster ear; maximum adjustment of plaster ear from 0-in. to $\frac{1}{2}$ -in.; choice of having clamp screws emerge either from beveled corner or from bottom of box. This feature allows the box to be mounted either on a flat surface or on the side of a stud.

Keystone Manufacturing Co., 23328 Sherwood Ave., Center Line, Mich.



Cut fastening costs up to 80% on heating and air conditioning installations...with the **REMINGTON STUD DRIVER**

"It saves us money on every fixture we install"—that's the kind of report we're getting every day on the Remington Stud Driver. Big savings just naturally result from the amazing speed of this powder-actuated tool. It sets as many as 5 studs a minute in steel or concrete!

You'll find real economy, too, in the fact that the Stud Driver is completely self-powered—no need for extra equipment, wires or cables. Compact and portable, the tool is designed in every

way for easy handling. And since it weighs only 6 pounds, it's ideal for working overhead and in confined spaces.

What's your fastening job? Whether it's fastening pipe to walls and ceilings or anchoring fixtures to concrete floors, you'll save money with the Remington Stud Driver. For complete information on how to cut your fastening costs, just send in the coupon below.

QUESTIONS YOU ARE ASKING

QUESTION:

What are the studs made of?

ANSWER:

Genuine Remington studs are made of a selected molybdenum-bearing alloy steel, heat-treated for required hardness and ductility properties. All are plated for protection against corrosion.

"If it's Remington—It's Right!"



Remington 

Listed & Approved by Underwriters' Laboratories, Inc.

MAIL THIS COUPON TODAY

Industrial Sales Division, Dept. E.C.M.-7
Remington Arms Company, Inc.
Bridgeport 2, Connecticut



Please send me free copies of the new booklets showing how I can cut my fastening costs.

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City _____ State _____

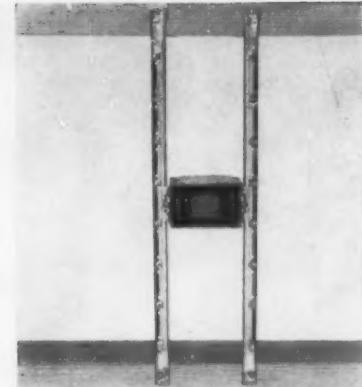


The *Lampanter* lurks in every poorly lighted plant, always prepared to pounce on profits and rip maintenance economy to shreds. Send him scurrying with his tail between his legs. Keep on hand an ample supply of CHAMPION Lamps and follow the simple, sensible suggestions in the *Champion Maintenance Manual*.

May we mail you a complimentary copy of the Manual?



CHAMPION LAMP WORKS
594 Broad Street, Lynn, Massachusetts



Switchbox Support (56)

A new switchbox support, designed to hold the box, or ganged boxes, securely in all directions. Known as the K-R support, it has nailing holes wherever desired. The flanged edges of the all-metal support bite into the studs to give a flush mounting. The supports are packaged in cartons of 100 sets.

Kruse-Ricke, Auburn, Ind.



Hoisting Machine (57)

Tirfor Griphoist is a multi purpose portable lifting and pulling unit. It combines the features of winches and all types of portable chain-hoisting devices. It weighs 42 lbs. The unlimited cable travel allows cable of any length to be used. Loads up to 10 ton's can be lifted by using multiplying sheaves. It can be used in any position—horizontally, vertically or diagonally. A telescopic handle is used to lift or pull when applied to lever, or to lower or release when placed on lever. Literature is available.

Griphoist, Inc., 671 Broad St., Newark 2, N. J.

Switch (58)

New Type M load transfer switch is rated at 100 amps, 5 kv line-to-line, for switching line-to-line loads, or 100 amps, 8.66 kv line-to-line, for switching line-to-neutral loads. It is a manually-operated SPDT unit having three integrally con-

nected phase leads that are 8.5 feet long and are terminated by hot-line clamps. Switch mechanism is housed in an oil-filled tank. An insulated hanger for the hot-line clamps is provided on the tank head. On the tank is an adjustable bracket for crossarm mounting. Complete unit is 31 inches overall and weighs 37 pounds including oil.

Line Material Co., Milwaukee 1, Wis.

Heating Wire

(59)

A new heating wire that can be used in dry-wall construction. It uses a nylon coating over the thermoplastic insulation, has a higher rating of 90 C which makes it practical for heating homes where "dry-wall" is used. In addition there is a heating wire for installation in plaster. Both types of wires are installed in the ceilings, and both systems are controlled by room or zone thermostats. Temperatures can be tailored to suit individual requirements by separate room or zone thermostats, and can be kept to within a 4 degree differential between floor and ceiling.

General Electric Co., Bridgeport 2, Conn.



Mail Box

(60)

New mail box arrangements for apartment houses are now available with stainless steel, plain steel or brass fronts to suit individual requirements. Multiple mail boxes are made in two models—with or without pushbutton for each receptacle. Units are supplied in gangs comprised of from 3 to 13 tenants' receptacles within one frame. Combined gangs may be ordered when more than 13 receptacles are required. One-piece frames, numerous fastening holes, and complete accessibility to interiors facilitate installation; generous construction of receptacle doors makes boxes easy to use for both tenants and postman. Bulletin 150M is available.

Auth Electric Company, 34-20 45th Street, Long Island City 1, N. Y.

Connector

(61)

New "Universal" Type DSCT stud connector is designed for wide conductor ranges and applications. They may be stocked for use with tubing and cable for straight or 90° connections. The conductor clamping cap is square, permitting rotation of 90° or reversal, thus providing copper cable ranges from No. 2 solid to

Rugged
Twist-Lock
TRADE MARK
SINGLE
FLUSH RECEPTACLES
NO. 7582

Now **BACK WIRED**

**TO SAVE WIRING TIME . . .
PROVIDE GREATER VERSATILITY**

Versatility . . . Suitable for back wiring, side wiring, or for the continuation of a circuit using combination of both. Back wiring makes unit adaptable for more products, especially where close wiring tolerances are encountered. Unit is available grounded.

Convenience . . . Back wiring permits easier, faster installation with no wire looping required. Strip gauge indicates exact amount of insulation to remove.

Electrician always has choice of side or back wiring method, or of continuing circuit using both. In this case, the same binding screw anchors both the back wire and the side looped wire. Positive contact is assured.

7580 Duplex Receptacle is also available with these same features.

**SEE YOUR
HUBBELL
DISTRIBUTOR**

*Highest
Grade*

HEAVY DUTY

WIRING



DEVICES

HARVEY HUBBELL, INC.

DEPT. C-1, BRIDGEPORT, CONNECTICUT

7HH54R

A

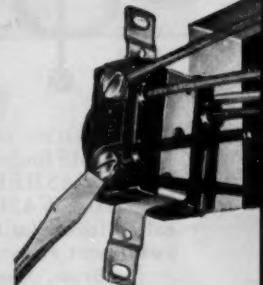
Deep-slotted binding screws suitable for back wiring, side wiring or both (see diagram below).

B

Back wired holes provide for inserting wires straight into back of receptacle.

C

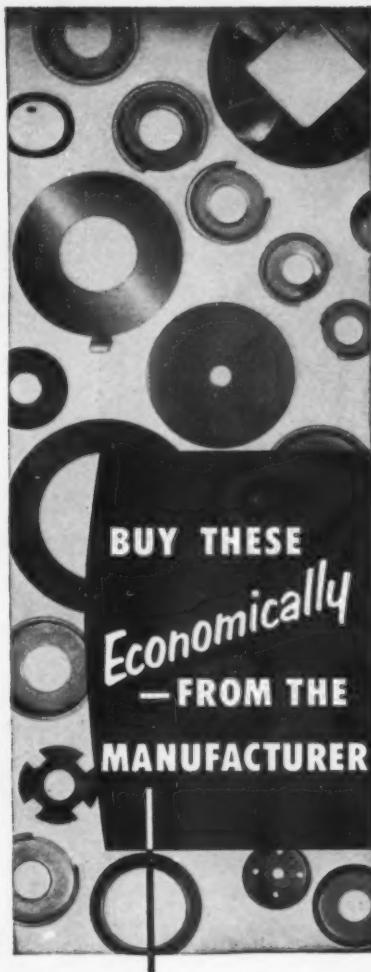
Strip gauge indicates amount of insulation to remove . . . eliminates wire looping.



Shows how circuit may be extended utilizing both back and side wiring. Same binding screw anchors both the wire inserted through hole in back and the side-looped wire.

This attractive Twist-Lock Fold er may very well have the answer to many of your wiring problems. Send for it today.





When you're ordering CUP WASHERS for binding screws; FLAT WASHERS; SPRING TENSION WASHERS, spherical or form rim type, whether you want them made from spring brass, phosphor bronze, or spring steel, and tempered: save yourself money by buying from the manufacturer.

The Whitehead Catalog lists hundreds of washer sizes; cable clips; pipe, conduit, and wire clips; burrs, plugs, spacer shims, retainers, gaskets. Write for this catalog and—buy what you need from it—Economically!

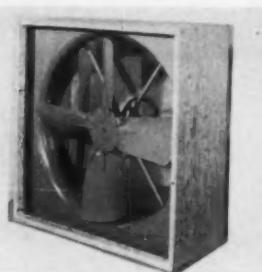


**WHITEHEAD
STAMPING CO.**

1679 W. Lafayette Blvd.
Detroit 16, Michigan

800 MCM and copper tubing ranges from 3/8-in. IPS to 2-in. IPS. Seven stud sizes are available from 1/2-in. through 1 1/2-in. diameters.

Anderson Brass Works, Inc., Birmingham, Ala.



Attic Fans

(62)

Vacuum fans for horizontal or vertical installation are available for residential use in sizes 24-, 30-, 36-, and 42-in. They feature a rubber molding strip around fan venturi to insure quiet operation when installed on attic floor. Fans are equipped with split phase, 60-cycle, 115-volt, ac motors equipped with built-in overload protectors. To install, a ceiling opening is cut to specifications, fan is placed on attic floor over the fan opening, shutters are attached to ceiling, motor is wired, and fan is plugged in. Vacuum fans are also ideal for installation in store buildings, warehouses, industrial plants, etc.

Vernco Corporation, Columbus, Ind.

Product Briefs

(63) Beaver Tool Company, Huntington Station, Long Island, N. Y., has introduced a new angle drive for small diameter extension drilling and reaming . . . (64) A new 8-in. diameter circular slide rule of laminated plastic has been added to the slide rule line at Allegheny Plastics, Inc., Coraopolis, Pa. . . . (65) Moe Light, Fort Atkinson, Wis., has announced "portable" pin-up and standing lamps for the home.

(66) A new photoelectric switch called the nitelighter, automatically turns house lights on when darkness comes is produced by The Fisher-Pierce Company, Inc., Boston, Mass. . . . (67) A new direct-writing recorder for voltage and current records, in both ac and dc models, has been announced by the Weston Electrical Instrument Corp., Newark, N. J. . . . (68) A new fluorescent lamp and starter tester has been announced by Lee Electric, Inc., Paterson, N. J. . . . (69) With the new Universal Tel-Alarm "UN-100 Series Circuits" it is now possible to use one type of plug-in unit for over 100 signalling sequence operations. Manufactured by Tigerman Engineering Co., Chicago, Ill.

(70) A new multi-purpose power unit, named the "Handi-Plant" is a combination electric generator, battery charging set and portable pump. It

has been developed by the Universal Motor Company, Oshkosh, Wis. . . . (71) A new type tungsten filament decorative lamp, named Nalcobrite, is available from the North American Electric Lamp Co., St. Louis, Mo. . . . (72) A compact, midget 4-way solenoid valve, standing 4 7/16-in. high with an overall length under 3 inches and depth of 2 inches, is being marketed by the Automatic Switch Co., Orange, N. J.

(73) A new type of ammeter designed especially to indicate low battery charging rates has been announced by the Rochester Manufacturing Co., Rochester, N. Y. . . . (74) Marcus Transformer Co., Inc., Rahway, N. J., have announced the marketing of their new portable booster transformer . . .

(75) Anderson Brass Works, Inc., Birmingham, Ala., has designed new "Hook-Over" hotline stirrup clamp.

(76) Dossett Manufacturing Corp., Brooklyn, N. Y., has developed a new line of service connectors which will be marketed under the trade name of "Dosson" . . . (77) New automatic flow switch operated by means of a differential of pressure across the orifice protects machinery. Trade name is "Shur-Flo" automatic interlock and it is manufactured by the Hays Manufacturing Co., Erie, Pa. . . . (78) Two new insulating materials for motors, generators and transformers have been developed by the National Vulcanized Fibre Company, Wilmington, Del.

(79) Electro-Technical Products, Nutley, N. J., has developed a new varnish glass cloth known as "A" Glass, and also Bi-Glas, a Class B insulating material. . . . (80) Blackhawk Mfg. Co., Milwaukee, Wis., has announced a complete line of 127 pullers and pulling attachments to fill all maintenance requirements . . . (81) A new generator voltage regulator which, by jumpering at the external terminals on the back of the self-contained factory-sealed unit, immediately becomes available for the regulation of any 25 to 250 kva generator, has been announced by Brown Boveri Corp., New York, N. Y.

(82) Wilbur & Williams Co., Boston, Mass., has introduced a new spray called Rust Shield, to protect metal surfaces from rust . . . (83) Teflon spaghetti tubing for high temperature insulation is now offered by the Polymer Corporation of Pennsylvania, Reading, Pa. . . . (84) Union Metal Manufacturing Co., Canton, Ohio, has developed a new-type overhead sign support for highway use.

(85) New Selectodyne magnetic hoist control for overhead cranes is available from the Whiting Corporation, Harvey, Ill. . . . (86) Teflon-impregnated lacing cord and tape, known as NEBROC, suited to high temperature applications, has been announced by Hittemp Wires Inc., Mineola, L. I., N. Y. . . . (87) Technical Appliance Corporation, Sherburne, N. Y., has announced a complete line of multi-set TV couplers.



DESIGNED for every taste-
and
PRICED for every pocket!

HADCO all-aluminum POST LIGHTING

HADCO offers a complete new line of all-aluminum posts and cast aluminum lanterns—designed to compliment any home and priced to suit your every customer.

Being heavy aluminum—they are completely weather-proof, being light-weight—they are easy to handle and install, being beautiful—they are appealing to the customer, being priced right—they are easy to sell. Oh yes! Check into the profits in it for you.

Shown at the left is a gracious example of HADCO Post Lighting. The decorative high relief wisteria motif as well as the lantern is cast aluminum.

COMPARE!

It is generally agreed that cast aluminum construction is far superior to sheet metal or stampings, and cast aluminum is what you get in the HADCO line. The lanterns are solid and sturdy looking. There is no riveting, soldering, etc. necessary with HADCO. The simplified lantern castings are easily and quickly assembled. There is a minimum of parts. The extra-heavy tubular aluminum posts are fluted to add a distinctive touch.

There is a complete line of posts and lanterns to offer your customers. Simple—decorative—dignified—traditional—and modern. There are styles with sign plaques, arrows, ladder-rest assemblies and side arm lantern mountings as well as many other distinctive features. For Post Lighting at its finest look to HADCO.

A few territories for manufacturers representatives still open.



a light for every home!

HADCO ALUMINUM PRODUCTS CO.

Designers and Manufacturers

501 PRESSLEY STREET • PITTSBURGH 12, PENNSYLVANIA

write for
**ILLUSTRATED
CATALOG**

CATALOGS and BULLETINS



The BALDOR Simplified Adjustable Speed motor system operates from A.C. circuits; delivers speeds from 0 to 2400 rpm., with instant, smooth acceleration to each higher speed; instant, smooth dynamic breaking to lower speeds or stop. Reverses instantly—even from full forward to full reverse. Separate components—mount in any position or distance apart. SIZES: to 3 h.p. for 2 or 3 phase operation; to 1½ h.p. for single phase operation.

ASK FOR
BULLETIN No. SP-6

BALDOR ELECTRIC COMPANY • ST. LOUIS 10, MO.

Baldor TOTALLY ENCLOSED STREAMCOOLED MOTORS REQUIRE Less SERVICING

BALDOR STREAMCOOLED Motors are solidly enclosed, cooled by an outer-mounted fan in the bell-end. They cannot inhale dust, dirt, grit or metal particles. They require no dismantling for cleaning thus LESS servicing—no interruption of production.

Other features of BALDOR Motors include sealed ball-bearings which can be re-lubricated without removing end-plates. Corrosion-resistant inside and out. End plates interchangeable for vertical or bracket mounting. Each motor individually dynamically balanced. Standard NEMA dimensions.

BALDOR ELECTRIC CO.
4353 DUNCAN AVE., ST. LOUIS 10, MO.

BALDOR ELECTRIC COMPANY • ST. LOUIS 10, MO.



(88) TEMPERATURE CONDITIONERS. Two catalogs, each covering description, performance, layout, engineering and service. Heating and ventilating units up to 23,000 cfm and 2.5 million Btu/h capacities are described in 40-page catalog 1620; Conditioning equipments to 20,000 cfm and 2 million Btu/h in catalog 1630, also 40 pages. Westinghouse Electric Corp., Sturtevant Div.

(89) COOLING TOWERS for commercial air conditioning systems range in capacity from 5 through 60 tons. 16-page catalog WT & CT-583 gives complete operating characteristics. Halstead & Mitchell.

(90) WIRE ROPE catalog lists weight, strength and design of the entire line. John A. Roebling's Sons Corp.

(91) POWDER TOOL SELECTOR gives at-a-glance information on the proper fasteners and charges to use with each type of application. Ramset Division, Olin Industries, Inc.

(92) TRAFFIC SIGNAL POLES of the mast arm, suspension and pedestal types are detailed in Catalog 84, 12 pages. Union Metal Mfg. Co.

(93) COLD CATHODE LIGHTING. Two 4-page folders. First gives the advantages of cold cathode units in industrial plants; the other lists the general characteristics of this type of lighting. Celine Inc.

(94) TEST EQUIPMENT. Motor rotation and phase tester is covered in Bulletin 80, a 2-page folder. Dielectric test set for measuring dc current at voltages up to 40 kv is the subject of 4-page Bulletin 22. James G. Biddle Co.

(95) SYMMETRIC REFLECTORS, their mounting assemblies and metal-enclosed downlights. 20-page Bulletin C provides complete specifications and layout data for the silver-mirrored reflectors and downlights. Pittsburgh Reflector Co.

(96) INDICATING INSTRUMENTS, laboratory portables and panel meters of many types are illustrated in this 48-page Catalog 28. Included are voltmeters, ammeters, frequency meters, shunts and control transformers. Hickok Electrical Instrument Co.

(97) PACKAGED SPEED VARIATORS for industrial processing systems are available in sizes from 1- to 200-hp. Bulletin GEA-6127, 20 pages, describes

operational features, typical installations and basic dimensions of various units. General Electric Co.

(98) RESIDENTIAL LIGHTING units for wall and/or table mounting. 4-page Form 214 illustrates latest designs in portable lighting. Moe Light.

(99) MOTOR STARTERS having short circuit protection for 2200-5000 volt systems called type ZHS contactors: the Valimotor units will safely interrupt the circuit from a bus of unlimited capacity. Booklet 1062, 16 pages, includes information on weatherproof and NEMA type VIII enclosures. Electric Controller & Mfg. Co.

(100) TROLLEY BUSWAY system of 60-amp capacity is cataloged in 40-page Bulletin 45; included are the new 20-ampere trolleys, curved track sections and extensive design and installation data. Feedrail Corp.

(101) PLUG-IN TIME SWITCH specially designed for room air conditioners up to one hp. 16-page Booklet NR44 includes prices. International Register Co.

(102) POWER PLANTS from 500 to 50,000 watts for any application; available in ac and dc. 8-page booklet describes new standardized line of units. Katolight Corp.

(103) TRACER CONTROL system. 6-page Bulletin GEA-6122 explains how system can automatically control a sequence of machine operations. General Electric Co.

(104) BATTERY CLIPS, antenna clamps and battery charging jumpers. Catalog 150, 8 pages. Mueller Electric Co.

(105) TRANSFORMERS, dry type, are available in single phase units up to 200 kva and in three phase to 300 kva, either auto or double wound. 16-page catalog contains illustrations, dimensions and diagrams of units. H-10-101. Harrison Transformer Corp.

(106) CURRENT-LIMITING FUSES for 250-volt and 600-volt circuits are used where conventional fuses do not have adequate interrupting capacity. Booklet 16-74. 8 pages, gives ratings, dimensions and operating characteristics. Construction Materials Div., General Electric Co.

(107) CONTROL CENTER for automatic temperature control systems centralizes equipment in a single cabinet, reducing installation time and simplifying layout. Bulletin F 5265-1, 8 pages. Barber-Colman Co.

(108) NURSES' CALL system includes two-way audio features as well as usual visual signals. 16-page booklet 170-C covers operating procedure, description of parts and wiring diagrams. Auth Electric Co., Inc.

For Easy Conduit Threading

2½" to 4" ... it's the 4P

RIDGID



**RIDGID 4P is easy to
carry, easy to put on conduit**

Balanced loop handles make it a cinch to carry and swing up on a conduit! Besides, the mistake-proof workholder sets to size before you lift it—only one screw to tighten on conduit. Easy upkeep—drive pinion in oilless bronze bearing; safe enclosed gear. 4 sets of 5 high-speed steel conduit dies, 2½", 3", 3½", 4". Ratchet handle. RIDGID drive shaft available. Save work—buy 4P at your Supply House.

The Ridge Tool Company • Elyria, Ohio, U.S.A.





Fouled contacts cause costly burnouts and down-time. Use VAP-OIL-TITE FITTINGS with Plastic Covered Flexible Metallic Conduit for Sure Seal of wiring on oil, water, dust and vapor tite equipment.

VAP-OIL-TITE'S exclusive threaded bushing not only insures positive grounding but also makes fitting easier to install

VAP-OIL-TITE FITTINGS

because a collar covers metal edges making burring unnecessary. Furnished in numerous types with body sizes from $\frac{3}{8}$ " to 2". Write or wire today for bulletin #MT-104 giving types, sizes and prices.

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Confusion
here . . .

There's order in this plant—and in the many, many other factories and offices equipped with Faraday signals and systems. They stop confusion and save steps, paging and signaling clearly and faithfully, day-after-day, year-after-year.

For generations, Faraday engineers have designed bells, buzzers, horns, chimes and complete systems to meet an endless variety of signaling needs and sound level requirements.

Consult your electrical wholesaler for details on the complete Faraday line.

NECK-TYPE BELLS

VIBRATION HORNS

HOLTZER-CABOT FARADAY STANLEY & PATTERSON

CONSOLIDATED BY:

SPERTI FARADAY INC. ADRIAN, MICH.

BELLS • BUZZERS • HORNS • CHIMES • VISUAL AND AUDIBLE PAGING DEVICES AND SYSTEMS

(109) **WIRING DEVICES.** Specific suggestions for improving electrical systems of schools and colleges by using the right type of wiring device for each job. Arrow-Hart & Hegeman Electric Co.

(110) **CAPACITORS** for motor starting and other intermittent-duty service. Bulletin 109 gives ratings and operating features in 4 pages. Micamold Radio Corp.

(111) **PANEL INSTRUMENTS.** 12-page bulletin GEC-368-F contains description, construction and application of ac and dc instruments. General Electric Co.

(112) **VIBRATION ANALYSIS** equipment: its uses, components and operation are covered in a 15-page booklet titled "Balance—Final Dimension of Precision". International Research and Development Corp.

(113) **SWITCHES** of the silent, mechanically-operated type. Called Quiette, they are available in three styles: Junior, Interchangeable, and Lifetime; latter styles are rated for operation on inductive fluorescent lighting circuits at 120 or 277 volts. 6 pages. Arrow-Hart & Hegeman.

(114) **CONTROLS** for domestic water systems including pressure switches, submersible-pump control panels, and sump-pump switches. GEA-6119, 6 pages. General Electric Co.

(115) **FAULTFINDER** for locating grounds on normally ungrounded systems. 8 pages. Parr Mfg. Corp.

New Books

Lightning Protection for Electrical Systems (116)

This practical guide gives the technical essentials of the subject in simple, understandable form. It covers the nature of lightning and its effects, the various means of protection, and how to select and apply arresters to different types of electrical transmission and distribution systems. Practical solutions. By Edward Beck. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 313 pp. \$6.50.

Modern Electrical Contracting (117)

This book, which is a British publication, can serve the American contractor well, for it deals with the universal problems of the trade: organization, accounting, inventory, equipment and personnel. Young men in the industry will achieve a broader view of their field and its special management techniques. By H. R. Taunton. Iliffe & Sons, Ltd., London, England. 176 pp.



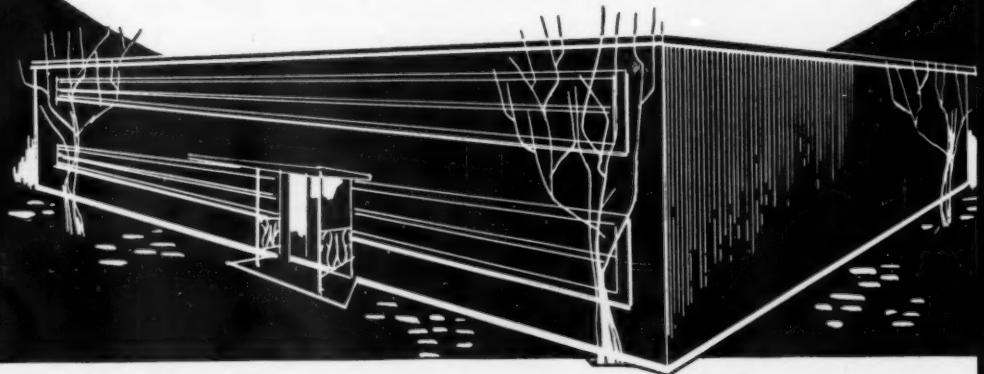
Wheeler Lighting Installation
for Doelcam Corp., Boston, Mass.
Lockwood Greene Engineers, Inc.

Wheeler

LIGHTING FIXTURES

A BASIC PRODUCTION TOOL OF
AMERICA'S LEADING INDUSTRIES!

Where good lighting is a "must," you'll find Wheeler on the job! In industry after industry . . . where modern progressive thinking rules . . . Wheeler Lighting Fixtures are the logical choice for maximum lighting efficiency!



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Lighting Equipment Specialists Since 1881
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ELECTRICAL WHOLESALERS

Rely on Quality

PYLE-NATIONAL LIGHTING FIXTURES

for longer service life, added Safety and Efficiency

INDUSTRIAL

EXPLOSION-PROOF

Pyle-National LE Series (Class I, Groups C and D)

For use in locations where highly flammable materials are manufactured or handled.

Rugged, flame-tight cast aluminum alloy housings render internal explosions harmless, and insure safe operating temperatures. Threaded construction permits easy access to interior for wiring and lamp replacement. Available in many types and sizes.



DUST-TIGHT

Pyle-National DE Series (Class II, Group E, F, G and Class III)

For use in locations where flammable dusts are present in quantity.

Strong, one-piece cast aluminum alloy housings are designed to exclude dust from the interior and to avoid accumulation of dust on the exterior surface. Available in many types and sizes.

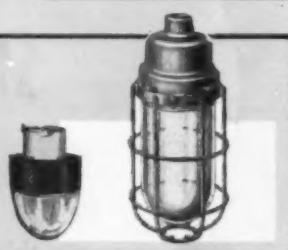


VAPOR-TIGHT

Pyle-National BO Series and Signal or Pilot Lights

For use in any outdoor or indoor location subjected to heavy concentration of non-flammable vapors, gases, dusts, or moisture.

Heavy-duty construction with efficient sealing features insures exceptionally long-life service. Full line for 10 to 200 watt lamps.

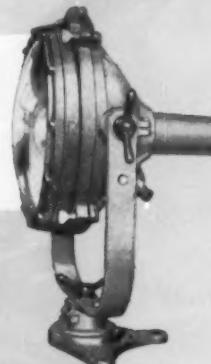


VAPOR-TIGHT
PIT FLOODLIGHT

Especially designed for recessed or surface mounting in walls or ceilings of pits, subways, or other locations where heavy moisture prevails. Reflector can be pivoted to adjust the angle of beam. Front glass is heat and impact resisting. Water drainage slots on cover.

WEATHER-PROOF
ENCLOSED FLOODLIGHTS

Sealed against moisture and dirt. Constructed throughout of cast aluminum and other corrosion-proof materials. Floodlights retain their original high efficiency output throughout an exceptionally long-service life with negligible maintenance and replacement expense.



THE PYLE-NATIONAL COMPANY

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QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published we pay \$5.00.

Reader's Quiz

Electronic Devices

QUESTION X25—In radio, television and other electronic devices, is there any source of power other than that of the local power system or batteries? That is, is the electronic device itself a source of power or does it receive power from another source? If so, what percentage is this of the total power?—E.B.

ANSWER TO X25—Electronic devices used in electrical equipment are not sources of power. These devices serve as would a valve in a hydraulic system, regulating the flow of electrical currents.

There is power loss in these devices due to the fact that they contain resistance and carry electrical current.—C.H.S.

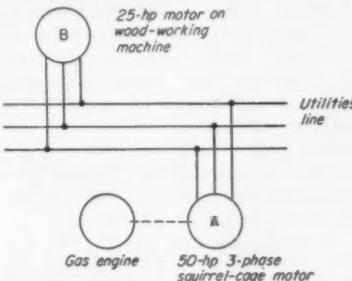
ANSWER TO X25—A modern radio receiver (broadcast, television, radar) accepts a radio-frequency signal from its antenna and by amplification and detection transforms it into an audio and/or visual signal. The power necessary to perform the amplification and detection in the receiver is obtained from either the local power system or from batteries. However, there is no audio and/or visual output from a receiver unless it also is receiving a radio-frequency signal from its antenna. This signal is usually in the order of less than 1 volt and represents a power level of microwatts. By contrast, the power taken from the local power system by a modern radio receiver is around 100 watts and that by a television receiver 300 watts.

If "E. B." collects the crystal sets of the early broadcast era, such sets operate entirely on the power contained in the radio-frequency signal, and no power at all is obtained from either batteries or the local power system.

An electronic device such as a radio transmitter or a diathermy unit is itself a source of radio-frequency power. However, it must be remembered that such generators of radio frequency power must be supplied with electric power in order that the electronic tubes may operate. In reality, this class of electronic device transforms commercial power (60 cycles) to radio frequency power (50,000 cycles per second and higher). The overall efficiency of a radio transmitter is under 50%—F.J.T.

Induction Motor

QUESTION Y25—(a) Would it be possible to connect motor "A" to a utility's line as shown and then drive it above synchronous speed with a gas engine to deliver rated current into the line? The object is to permit connection of motor "B" without increasing the current in the utility line, which



would necessitate the installation of heavier feeders. What type of protection would be required between the line and motor "A"? How would capacitors be installed to correct the power factor?

(b) What size 3-phase generator would be required in place of the gas engine and motor "A" to produce the same result? It is not practical to drive motor "B" directly by the gas engine.—A.S.N.

ANSWER TO Y25—It is theoretically possible to drive an induction motor above synchronous speed to generate current; however, the induction generator must obtain excitation from the power system, thereby lowering the system power factor. Also the flow of reactive power for generator excitation would impose an additional load on the feeders. Of course a portion of the reactive excitation power could be supplied from capacitors but this portion would have to be carefully limited to prevent loss of stability. If the system could stand the necessary reactive power flow the generator could be protected simply by overcurrent relays which would function for either overload or internal faults.

Before going to this somewhat elaborate scheme, I would like to recommend two courses of action:

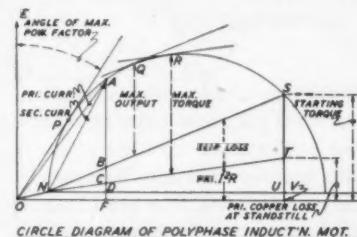
1. Review plant power factor. Perhaps the reduction in reactive power flow over the existing feeders that can be realized by proper application

of capacitors would free enough feeder capacity for the additional 25 hp motor.

2. Weigh the economics of the proposed scheme against that of replacing the existing feeders. New feeders will provide capacity for future loads which are not visualized now and which could not be handled by the induction generator.

If it were decided to utilize a separate 3-phase gas engine driven generator to supply power to the 25 hp woodworking machine alone, I would suggest the use of a 25 kw generator. With a generator of this size the voltage would drop to the vicinity of 75% of its rated value which is usually considered to be the minimum allowable value for reliable starting.—L.D.B.

ANSWER TO Y25—An induction motor, if DRIVEN 5% above its synchronous speed when connected to an ac power source of nameplate value, will deliver power to the external circuit. This generator operation is easily visualized from the circle diagram, Fig. A, corresponding to the lower half of the circle in which the current vector is



CIRCLE DIAGRAM OF POLYPHASE INDUCTN. MOT.

OE—IMPOSED FIXED VLTGS. AB—MOTOR OUTPUT
ON—NO LOAD CURRENT AC—TQURE X SYNC. SPEED
OS—LOCKED ROTOR Curr. BC—SECONDARY I^2 LOSS
VS—TOTAL MOT. INPUT WITH CD—PRIMARY I^2 LOSS
VT—LOCKED ROTOR E—NO LOAD COPPER AND IR. LOSS
OA—PRIMARY CURRENT F—SECONDARY I^2 LOSS
NA—SECONDARY CURRENT G—MAX. POW. FACT. POINT
AE—MOTOR INPUT H—PRIMARY I^2 LOSS
ST—POWER INPUT TO MOTOR AT STANDBY I—NO LOAD COPPER AND IR. LOSS
J—SECONDARY I^2 LOSS
K—PRIMARY I^2 LOSS
L—NO LOAD COPPER AND IR. LOSS
M—SECONDARY I^2 LOSS
O—TOTAL MOT. INPUT WITH LOCKED ROTOR
V—PRIMARY I^2 LOSS
W—SECONDARY I^2 LOSS
X—PRIMARY CURRENT
Y—SECONDARY CURRENT
Z—MOTOR INPUT

AN INDUCTION GENERATOR DIAGRAM WOULD CORRESPOND TO THE LOWER HALF OF THE CIRCLE IN WHICH THE CURRENT VECTOR IS DIRECTLY BELOW THE OV LINE.

FIG. A

directly below the "OV" line. The unique feature of this type of generator is that the power factor of the output is fixed in value by the generator (or motor) characteristics and is always leading, independent of the external circuit.

The explanation is that the generator draws its entire excitation from the system and so must receive a definite amount of lagging kva for a given

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voltage and load current. For this reason, induction generators alone cannot supply a power system but must always operate in parallel with synchronous machines (such as A.S.N.'s) or with capacitors.

Motor "A" as an induction generator will deliver an instantaneous short circuit equal to the terminal voltage divided by its stand-still reactance, but its rate of decay is much faster than that of an alternator of the same capacity, and its sustained short-circuit current is zero.

Since the induction generator must have a laminated rotor to provide slip-frequency rotor magnetic field, its construction is not adapted to as high speeds per diameter as synchronous machines utilizing solid steel rotors. For these various reasons, induction generators have found few practical applications, their chief use being power savers in aircraft motor testing and in variable-ratio frequency converter sets, where the induction end of the set operates as a motor or a generator depending on the direction of power flow through the set.

Protective devices are indicated in Fig. B. Should A.S.N. select an ac-

ting and current limiting control, with rather precise engine speed control, should be provided. Unless the system is extremely small, in which case heavier feeders should not cost too much, it would probably be entirely possible to add sufficient static capacitors to unload the feeders to the extent that the feeders, as existing, would carry another 25-hp motor.

A 35-kva 3-phase generator should be ample to supply a 25-hp induction motor, but again the solution sounds impractical, as the initial cost and operating cost would both be high. In addition to the generator a prime mover, a driving source for the generator, would have to be provided, together with an exciter or source of excitation with voltage regulating equipment, speed control, relays and meters. While the information provided is not sufficient to base an opinion on, it would appear that the problem would most easily be solved by either adding capacitors or installing heavier feeders. —J.P.

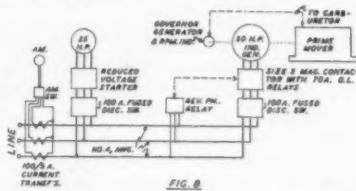
Fluorescent Tester

QUESTION Z25—Do any readers have a wiring diagram of a simple fluorescent tester that is small enough to be carried handily in a tool box?—L.W.F.

ANSWER TO Z25—If you will contact Ideal Industries, Inc., Sycamore, Illinois, and ask for information on their Flur-Test catalog No. 61-015 and 61-016, I am sure you will find a tester that will satisfy you.—G.J.

ANSWER TO Z25—I have used a series test lamp quite frequently in analyzing fluorescent circuits. By using a predetermined pattern I have tested the circuit wiring and fluorescent tubes for continuity. On other occasions I have used a testglo tester which was adequate to pin point the trouble. However, there are manufactured a few testers of the bulky meter type which would be too large to be carried handily in a tool box.—J.B.K.

ANSWER TO Z25—There is a tester on the market that consists of a neon lamp connected in series with a resistance. This resistance has a sliding contact that is moved by turning a knob which points out at the approximate voltage markings alongside of the pointer on the knob as the neon light goes out. It has a range from 65 to 660 volts on ac. Special direction for use on direct current. This type of tester is made by Industrial Devices, Inc. Edgewater, New Jersey. This type of tester must have power service (115 volts) for its use.



generator (alternator), an engine or prime mover will still be required as will synchronizing, field, governor/frequency control, indicating instruments and protective relaying. A 25 kw unit is minimum size for this setup as motor "B" at 25 hp consumes 18.5 kw at full load.

The possibility of reversing the action of a polyphase watt-hour meter due to a power source on either side, may not be condoned by the utility company; nor will p.f. or surge disturbances. These can be prevented by good instrumentation and reasoning.—R.R.T.

ANSWER TO Y25—While it is entirely possible to connect a gas-engine-driven, 50-hp, 3-phase, squirrel cage induction motor to the utility's system (providing the utility is in agreement), driving the motor above synchronous speed so that it will operate as an induction generator, excited from the utility system, does not appear to be a practical solution.

The installation cost and the operating cost resulting from low efficiency will both be high. In addition to the protective relaying required to obtain satisfactory operation, voltage regula-

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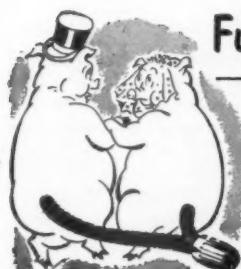
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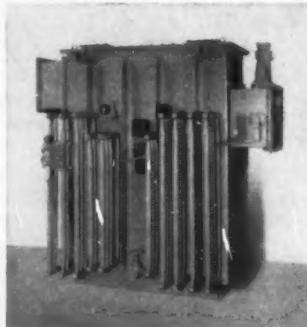
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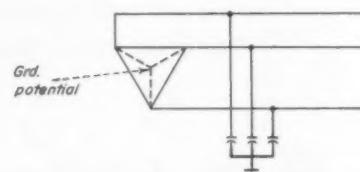
—O.C.

Ungrounded System

QUESTION A26—Recently I installed a 480-volt, 3-phase ungrounded system, connected delta-delta. At the breaker in the building I took a reading from each leg to ground, and got 278 volts. I called the utility company for information concerning this. They told me it was capacitance reactance and that it was common in a delta-delta system with a high primary voltage of 13,800 volts. I was also told that it may be harmonic currents.

Could someone tell me more about what causes this high voltage to ground?—R.H.L.

ANSWER TO A26—Every three-phase system is inherently grounded through the distributed capacitance of conductors, motors, transformers and other equipment. This distributed capacitance is shown in the diagram as lumped in one place. With balanced capacitances as shown, the neutral of the system is held at ground potential. The voltages between each phase and ground is the same as the voltage between the phase and the theoretical

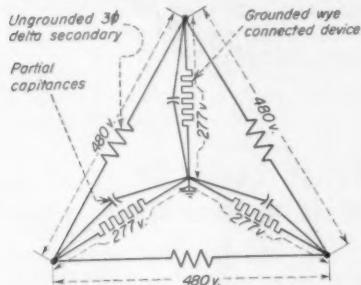


neutral. These voltages are represented in the diagram by dotted lines within the voltage triangle. It can be seen that these voltages are each equal to the line to line voltage divided by the square root of three, or in this case, 480/1.73, or approximately 277 volts. This is perfectly normal and should be expected in every 480-volt ungrounded system.

As a matter of interest, if one phase

of this same 480-volt ungrounded system should become grounded either intentionally or accidentally, the voltage between either of the other two phases and ground will become 480 volts.—L.J.C.

ANSWER TO A26—The 278-volt reading from each line to ground would indicate that you have a wye connected grounded device in your secondary system. It might be a ground detection instrument. Such a device would locate the ground point at an equal voltage from each line, since the impedance of each leg would be the same. See Fig. 1.



If you have no wye connected grounded device on your system, then the partial or distributed capacitance of each leg to ground is responsible for the location of the electrically neutral or ground point. This capacitance is due to the "image charge" induced in the ground. The value of the capacitance is small, depending on the length and size of the cables, and their physical locations. In general, the distributed capacitance will not be the same for each line, except in a perfectly symmetrical, transposed system. Therefore I doubt if your line to ground voltages are determined by this factor alone.

The line to ground voltages on your system can be changed, but in all cases of operation the vector sum of these voltages will be zero. Hence, as one line to ground voltage diminishes, another will increase.

No third harmonic voltage can appear at the terminals of a delta connected system, since this voltage is consumed in circulating a current in the closed loop.—L.S.

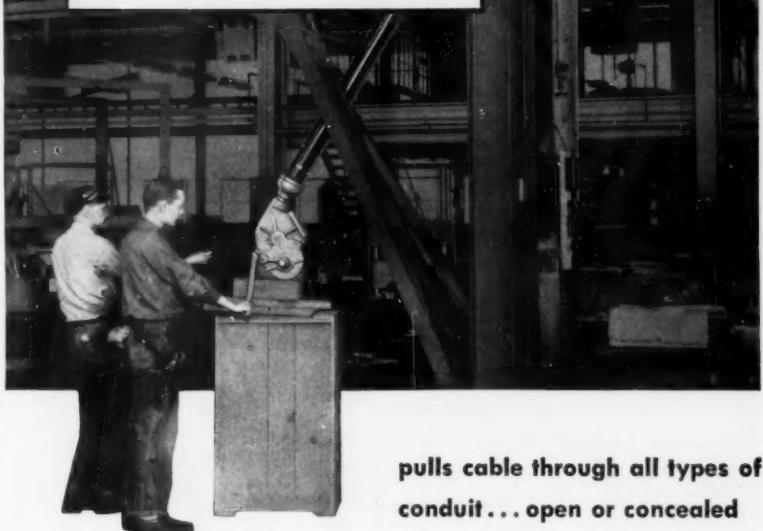
ANSWER TO A26—The conductors of any ungrounded balanced three-phase system have capacitances between one another and to ground. The line-to-line capacitances have little influence on the grounding characteristic of the system. Since the neutral of the line-to-ground capacitances is at earth potential it follows that the neutral of a balanced ungrounded three-phase system is held there by the balanced electrostatic capacitances to ground. In a sense the system is capacitively grounded. This phenomenon is true for any balanced three-phase ungrounded

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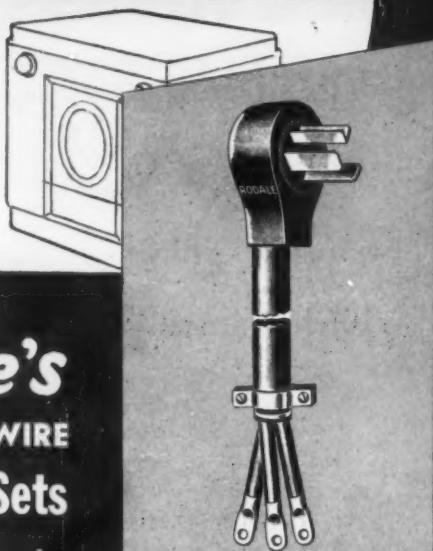
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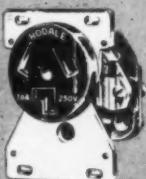
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system, wye or delta connected, regardless of the voltage class. In the case described, it is independent of the primary voltage or primary connection to ground.

The voltage measured on the reader's system is not unreasonable or unexpected. The secondary transformer delta-connected winding can be replaced with an equivalent ungrounded wye-connected winding in which case each leg would develop a voltage of $480/1.73 = 277$ volts. This voltage would be to ground due to the electrostatic capacitances. Conversely, vector addition of the leg voltages to ground as held by the line-to-ground capacitances would result in $277 \times 1.73 = 480$ volts line-to-line.—J.S.

Brush Leads On Welding Machines

QUESTION B26—What causes brush leads to fall out of the brushes on 300-ampere welding machines? On several occasions I have been called on welding machine trouble to find that many of the dc brushes have the leads loose or dropped out of the brushes. What is the cause and is there a remedy?—E.S.H.

ANSWER TO B26—Just recently we have discussed your particular question and have come to no conclusive decision.

However, we have found that this trouble occurs in motors other than a welding machine. After carefully considering vibration, overheating, excessive load and other factors we have decided that perhaps the brush leads were improperly or poorly seated in the brush. Then these aforementioned factors contributed to the brush leads falling out.

As a remedy for this situation we have taken the original brush, gouged it out to form a sort of cylinder with the tip cut off, then inserting the brush lead and filling the remainder of the hole with solder or some conducting mixture which has bonding qualities insures a connection which is reasonably resistant to vibration and the high temperatures encountered.—J.B.K.

ANSWER TO B26—The brush leads are too small for the lead. Six brushes are supposed to divide 300 amps. If the voltage drop between the ends of the 6 brush leads are the same under load, then each brush will carry 50 amps. If 5 brushes will not take their share of 50 amps each, then brush 6 may carry 300 amps. Use a tester while the brushes are in the welder to locate the high resistance joints.—H.S.

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these QUESTIONS?**

QUESTION M26—What can be done to correct starting trouble of a $\frac{1}{4}$ -hp Leland capacitor start motor? This is a single-phase externally reversible 220-volt motor, controlled by a standard drum type reversing switch, manually operated. A motor rebuilding shop has replaced both the starting switch and the condenser, but it did not help. Since the motor still failed to start, I checked the motor for end play, loose connections and worn bearings and found nothing wrong.

What we did find was this. With the motor running or stopped the condenser holds its charge until short circuited across the terminals. Even after the motor had run, shut off and came to reset the condenser was not discharged. If the motor fails to start, all it does is hum slightly and does not seem to draw much current, as it has remained turned on without starting for as long as 30 minutes without overheating. When stopped, a slight pull in either direction will start it.—A.E.

QUESTION N26—Would a person who is well grounded receive a shock if he touched a hot wire of a 480-volt, 3-phase ungrounded secondary delta connected with a star 4-wire grounded neutral primary?

A party told me he received such a shock, but I can't see how. This could bring up some interesting discussion on the effects of insulating transformers.—G.R.G.

QUESTION P26—I should like to know how to totally and permanently get rid of static electricity on large flat leather belt drives in a plant. These belts travel at about 800 feet per minute.—F.J.D.

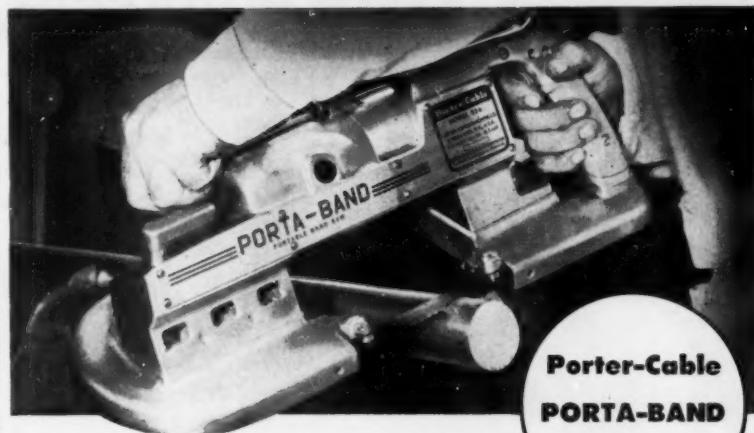
QUESTION Q26—Can someone list a good formula for determining what hp a motor frame is good for by using core diameter, core length, and iron behind slots, etc.?—A.J.D.

QUESTION R26—I installed a vibrator type inverter recently and noticed in the instructions that it was not suitable for very low power factor loads. Would this work o.k. if the load volt-amperes were kept within the 100% power factor wattage rating? —P.S.

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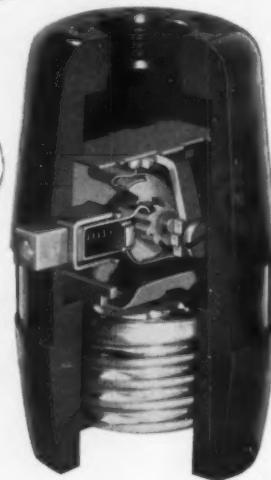
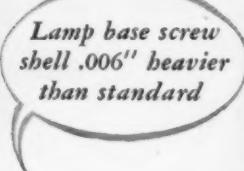
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Questions on the Code

Answered by

B. A. McDONALD, New York Board of Fire Underwriters, Rochester, N. Y.

GLENN ROWELL, Electrical Engineer, Fire Underwriters Inspection Bureau, Minneapolis, Minn.

B. Z. SEGALL, Consulting Electrical Engineer, New Orleans, La.

Isolating Type Transformer

Q. I was recently asked to install a ground detector on the lighting circuits to a hospital operating room and upon looking over the installation, I found that the original contractor had made use of an ordinary 1 to 1 transformer, so I explained to the hospital administrator that the conventional ground detecting device would not be able to function until the existing transformer was replaced by one of the isolating type. Why doesn't the National Electrical Code specify that the transformer shall be of the isolating type?—L.E.

A. In the National Electrical Code under Section 5135 paragraph f. 1, you will find it does state that each circuit within or partially within an anesthetizing location shall be controlled by a switch having a disconnecting pole in each circuit conductor and shall be supplied from the ungrounded distribution system which shall be isolated from any distribution system supplying other areas. Such isolation may be obtained by means of one or more transformers having no electrical connection between primary and secondary windings or by means of motor-generator sets or by means of suitably isolated batteries. While it is probably true that this wording may be construed by some individuals as not requiring a special designed transformer having a grounded shield between the primary and secondary windings, it certainly was the intent of the Code authorities in preparing this section that this type of transformer be used, as it is the only type of transformer which could bring about isolation of these circuits from the balance of the wiring in the hospital.

Unfortunately this same condition is being found in many hospitals and it should be corrected by the replacement of the improper transformer with one having a grounded metallic barrier between the secondary and primary windings so there will be no possibility of either current leakage or an actual fault between the primary and secondary turns. In this same connection it

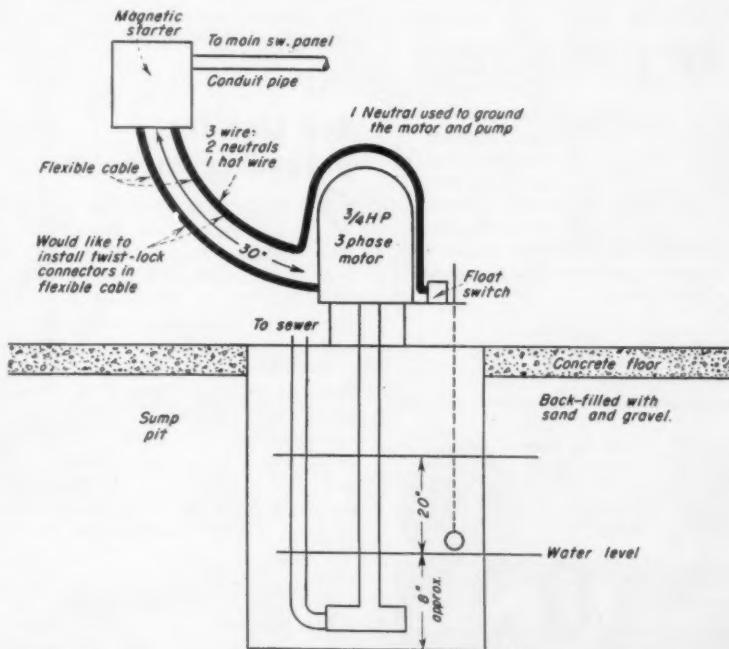
might be well to caution against the use of conventional transformers for the supply of trouble lamps or low voltage machine lighting because here too transformers only of special design should be used to preclude the possibility of a fault permitting primary current to reach the secondary windings.—G.R.

Sump-Pump Connection

Q. I am writing for information in regards to hooking up a $\frac{3}{4}$ -hp 3-phase electric motor and float switch with twist-lock connection. Here on the base we have a large number of sump pumps which have to be removed at least once a month to clean out the sump pit of lint and other waste. In order to do this, an electrician and a plumber have to go there each time a pump has to be removed. If twist-lock plugs were to be installed only a plumber would have to answer the call. I submitted a work order to install the twist-lock and I was informed that it is against the electrical Code. A sketch is shown below.—R.M.

A. Section 4003 of the Code permits the connection of stationary equipment by the use of a cord to facilitate their interchange or to prevent transmission of noise or vibration. It also recognizes the use of a cord for the connection of a portable appliance. Under Article 100 the Code defines a portable appliance as one capable of being readily removed where established practice or the conditions of use make it necessary or convenient for it to be detached from its source of current by means of flexible cord and attachment plug. The above Code provisions indicate to me that when an appliance such as the sump pump in question must be serviced frequently, that a cord and receptacle connection is permitted provided no unusual conditions are involved with the installation, and I believe this opinion is shared by other inspectors.

I believe however that your proposal for making the connection by the use of twist-lock connectors inserted in the cords could be criticised unless the equipment was so located that it would be impracticable to do otherwise. The preferable procedure would consist of a conduit run from the starter to two



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fixed receptacle outlets located close to the motor and the float switch. This would minimize the use of cord necessary to make the connections and tend to decrease the mechanical injury hazard concerned with the use of cords. I assume that the flexible cables shown on your diagram are approved flexible cords suitable for the voltage of the circuit, the mechanical injury hazards involved and the nature of the location with respect to dampness. I also assume that the motor and pump assembly will be properly grounded by the use of grounding conductors in the cord assemblies and that the twist-lock receptacles and caps have slots and prongs suitable for the grounding connection. It also appears that the caps used should be of non-conducting material since metal caps in this location would present a shock hazard. Since the connection involves two separate cords, one for the motor supply and the other for the switch control, it appears to me that grounding of the equipment should be made through both cords. This would eliminate an accident which could occur in the event the one cord carrying the ground wire was not connected.

While the above installation would eliminate the necessity for the electrician accompanying the plumber when servicing is required, it should not be inferred that his responsibility ends at this point. In view of the fact that many such pumps are located in damp or wet locations and are subjected to frequent servicing by plumbers, it is of considerable importance for the electrician to make frequent inspections to assure that the cords and the ground connections are properly maintained.—B.A.McD.

been recognized and most gas companies have set up proper procedures to minimize the danger you describe.

In the particular case of our local utility, it owns both the electric and the gas property, and even though all grounding is made to the water piping system, it is recognized that it is possible to have the gas piping touching the water piping system at some point in the building. Therefore, all service men are required to jumper out the gas piping before making any disconnects at the meter or at any other point in the gas system. We have had some ignitions of the gas when lines have been broken or the meter removed, but to the best of my knowledge no explosions have resulted. Explosions of course are possible with conditions existing which would contribute to such explosions.

It should be noted that grounding to the gas piping is at best third choice. Basically grounding to the water pipe is more or less mandatory, and these other electrodes as outlined in 2582 are only secondary choices. It should also be noted that the gas piping system must be a continuous metallic underground system. Nowadays, cathodic protection systems require that these gas lines be pretty much broken up into sections with insulating joints, and also, much of the piping is coated, so that the gas piping is far from being an effective grounding electrode.—B.Z.S.

Fluorescent Lighting

Q. We are about to install the electric wiring in a portion of a plant which will be used for the drying of painted articles in the open and there is some question concerning the type of electrical equipment which should be used in this room. The room is approximately 60 by 120 feet and contains four paint spray booths with a monorail running through each booth and then in loops beyond the booths before leaving the area so the articles being painted will be dried in the open. The paint spray booths have wire glass panels incorporated in their ceiling construction and if possible we would like to light both the interior of the booths through these wire glass panels and the general drying area beyond the booths with ceiling mounted fluorescent lamps. Will the Code permit this?—A.M.O.

Gas Line for Grounding Purposes

Q. Received a copy of the National Electrical Code recently and while reading it ran across a factor with which I definitely object. On page 76—2582b "it is permitted to use a gas line for grounding purposes".

Suppose a gas line in the basement of a building were to be accidentally ruptured and gas escaped into basement. If someone were to touch the ends together while a surge of grounding energy was taking place and cause a spark to occur, the building might be blown up. It is not likely to occur, but it is a definite possibility.—L.L.S.

A. The grounding to gas lines has been permitted for many years. The problem you outline has

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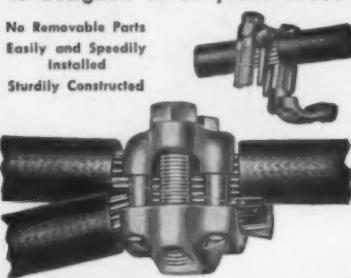
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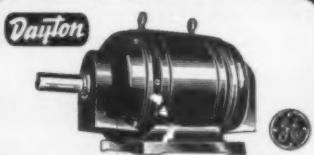
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effective interlocks to de-energize all electrical equipment, other than equipment approved for Class 1 locations in case the ventilating equipment becomes inoperative, may be classed as a non-hazardous area by the Code authority having jurisdiction.

Therefore, if your electrical inspector is contacted, he no doubt will give you permission to use the ordinary ceiling mounted fluorescent lights provided you can assure him there will be from 8 to 12 air changes per hour in the drying area and that the fans bringing about these air changes will be provided with controls which will make it possible to energize the lighting circuits only when the fans are in operation. These controls should be so devised that they will make it necessary to have the ventilation system running long enough to bring about three air changes before the light circuits can be energized. Then ventilation of the room should be so arranged as to remove solvent vapors which are heavier than air, making it necessary for the discharge openings to be at or in the floor and so spaced that the entire floor area will be swept free of any accumulation of these vapors. In many instances the air discharged from a single paint spray booth is sufficient to cause an adequate number of air changes in the area in which the booth is located, and if the make-up air introduced into this room is properly directed by suitable duct work, the entire floor area may be swept free of any accumulation of solvent vapors outside the booth.

In your case, where four booths will be used, it should be a rather simple matter of so locating these booths and the make-up air inlets that the air being discharged will adequately ventilate the drying area.—G.R.

Grounding Interior Wiring Systems

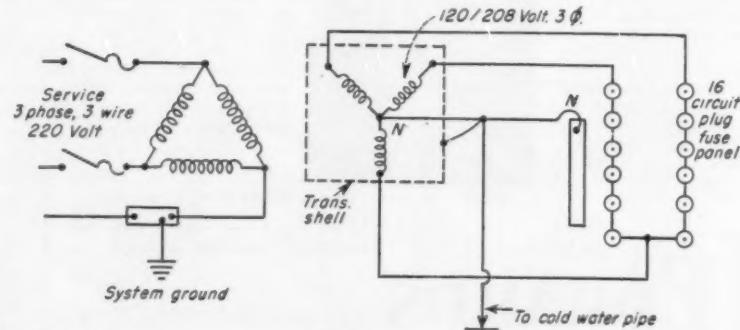
Q. If interior lighting is supplied by dry-type lighting trans-

formers from a 220-volt, 3-phase 3-wire supply, is an interior ground mandatory? I've always assumed that it was. Occupancy: industrial. See illustration below.—P.P.G.

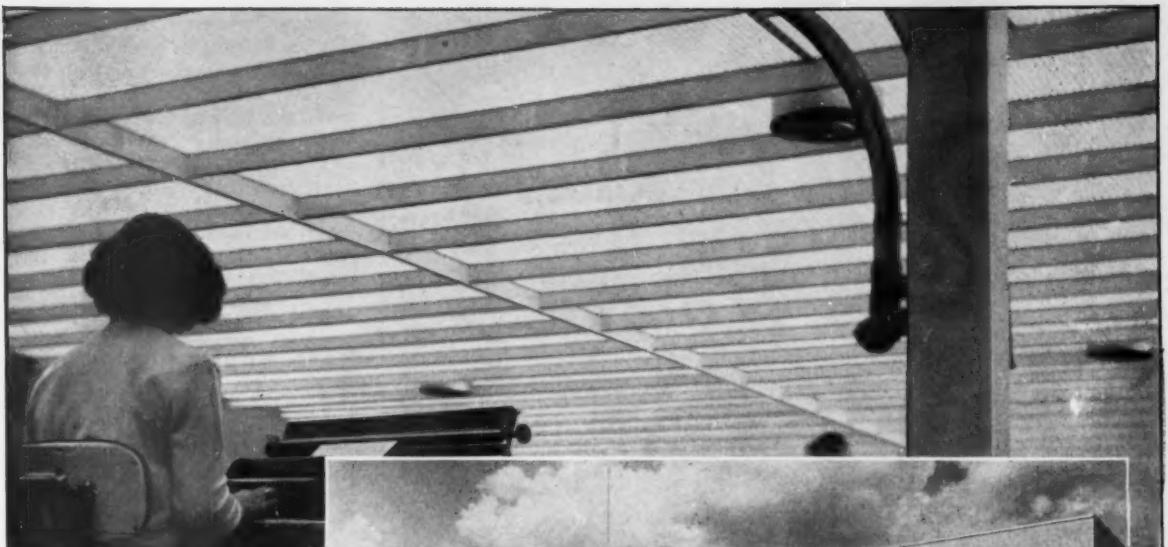
A. Section 2514 of the Code requires a secondary alternating current system supplying interior wiring and interior alternating current wiring systems to be grounded when the maximum voltage to ground does not exceed 150 volts.

Section 2526 covering Isolated Systems indicates that interior wiring systems which are not directly connected to exterior secondary distribution systems but are derived from the use of generators or transformers, as shown in your example, must be grounded when the maximum voltage to ground does not exceed 150 volts and sets up provisions for the point of connection for such grounding. It appears to me that this provision of the Code covers the case in question.

Section 2511 covers the objectives to be attained through the grounding of circuits as follows: "Circuits are grounded for the purpose of limiting the voltage upon the circuit which might otherwise occur through exposure to lightning or other voltages higher than that for which the circuit is designed; or to limit the maximum potential to ground due to normal voltage." While the interior wiring system or circuit which is derived by the use of the dry-type transformers shown is not as vulnerable to the hazards of the outside distribution system as in the case where a direct electrical connection is made to the distribution system, it is evident that the maximum potential to ground due to normal voltage may be limited only through the grounding of the secondary of the transformer. As you show in your illustration, the failure to ground the neutral of the wye secondary could result in various voltages, especially when the phases are unequally loaded. As a result, the maximum voltage to ground would vary and the objective covered by Section 2511



Note: Without a ground several potentials to ground exist.



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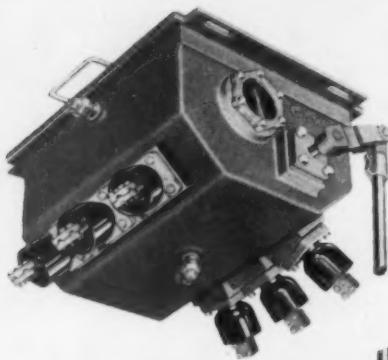
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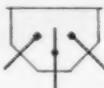
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would not be satisfied. It is also evident that the safeguards obtained through polarity identification with the ground wire run to the screw shells of sockets would not be attained in the absence of the secondary ground connection.

As a result of the foregoing observations, there is no question in my mind regarding grounding the transformer shown and I believe the Code definitely requires such a ground connection.—B.A.McD.

Bare Neutral

Q. One of our consumers wishes to increase conductor size in conduit already enclosed in the building and wishes to use a bare neutral with two asbestos insulated cables. The neutral will be the same size as the other conductors without insulation and will provide the extra capacity needed.—L.W.P.

A. Asbestos insulated cables may be used for general use in conduit as per Article 310 of the Code. There are several types approved, such as Rockbestos, Deltabeston, etc., which types are generally known as Code Types AVA, AVB and AVL.

The bare neutral is not approved for general wiring. Section 2303 approves the use of a bare neutral for services and Article 338 approves it for use in range circuits, clothes dryer circuits and domestic hot water heaters. This article also approves its use for feeders from a service cabinet to supply other buildings, or as a service entrance for such other buildings when the three conditions set up in this Article are met. In other words, the bare neutral would not be approved for the subfeeder within the building beyond the service entrance in this same building, nor would it be approved for the branch circuits and other feeders.—B.Z.S.

Grounding Conductor

Q. What size grounding conductor must I use on a 4-wire 3-phase service where 2-phase conductors are 500,000 CM? The third phase conductor and the neutral are both 3/0 conductors.—R.C.G.

A. Under Section 2594 you will note that if you are grounding this service to an underground water distribution system, you will have to use a No. 0 conductor because under this section it states the size of the largest service conductor determines the size of the grounding conductor for the service. You will also notice, how-

ever, that if the ground to earth is made by means of a made electrode as described under Section 2583, the grounding conductor need not be larger than a No. 6 copper wire or its equivalent in carrying capacity. In other words, if you are using a driven ground rod or a driven pipe or a buried plate, a No. 6 copper conductor would suffice—G.R.

Paralleling Generators

Q. Is it advisable to eliminate the fourth or neutral wire of a 3-phase, 4-wire, 480-volt, 60 cycle generator if it is desired to operate this unit on a system where the power is supplied by two 3-phase, 3-wire, 480-volt, 60 cycle generators? The former is rated at 150 kw and the latter at 400 kw each.—P.C.J.

A. This question is not actually a code question. It seems you have an engineering problem involving the method to be used to parallel generators.

Basically generators may be paralleled if frequencies match and are constant, if the voltages match and if the voltages are in phase. The division of load will depend entirely on the prime movers of the generators. To insure proper sharing of the load the speed load characteristics of the prime mover governors must be the same. The field excitation on the generators must be adjusted to give power factors equal to that of the loads from the other generators, but it in no way affects the division of load.

The grounding of the fourth wire and thus the desirability of using a neutral conductor depends on whether or not a grounded neutral system is being used for the parallel generators. To prevent cross currents between generators due to dissimilar wave forms of the generators, it is usually the practice to ground only one of the generators and leave the others ungrounded. This may determine in your case whether or not the neutral should be installed.—B.Z.S.

Lighting Switches

Q. In a hospital operating room, is it necessary to provide a two pole switch for the control of a lighting fixture supplied from an isolating circuit?—M.L.L.

A. Under paragraph f. of Section 5135 you will note that each circuit within or partially within an

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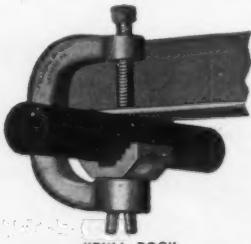


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anesthetizing location shall be controlled by a switch having a disconnecting pole in each circuit conductor.

And then in Section 5-10 of Pamphlet No. 56 containing the requirements for safe practice in hospital operating rooms you will find the requirement which reads as follows: "Lighting Switches. In hazardous locations, switches controlling lighting circuits shall comply with the requirements of Section 5016 a. of the National Electrical Code and in addition such switches shall be of the two-pole type and so connected to open both sides of the ungrounded circuits which they control.—G.R.

Calculating Size of Service

Q. In calculating the service size for a large dwelling, can we not disregard the load of the off peak water heaters used?—M.W.

A. No. It would be impossible to disregard the connected load of an off peak water heater as the Code only permits the use of a demand factor for lighting loads in excess of 3,000 watts and under paragraph e. of Section 2203 you will notice it is possible where four or more fixed appliances in addition to an electric range and space heating equipment are connected to the same feeder, a demand factor of 75% may be applied to that fixed appliance load. If less than four such fixed appliances are provided, then, of course, you must use 100% of the total connected rating of the devices in determining the size of the service or feeders and the feeder load for the electric range is determined in Table 29 found in Chapter 10 of your Code.—G.R.

"T" Rated Switches

Q. The Code mentions a switch with a "T" rating. I cannot get the full understanding of the term. What should be its capacity when the load is (a) non-inductive (b) inductive?—P.C.J.

A. This is covered by Section 3814. Paragraph "b" is the only one which refers to the "T" rating. The tungsten filament lamps impose a very heavy load on the circuit at the moment the lamp is first turned on. This is due to the very low cold resistance of the filament. For example, a

100-watt lamp has a normal current of .835 amperes (120-volt rating assumed). Based on the cold resistance value, the theoretical inrush current is 13 amperes and the actual measured value is 9.0 amperes. While these current values are not of very long duration, they will have a marked effect on the efficiency of operation of the toggle switch controlling the lamp. Time for current to reach its maximum value is about 1/10 of a second.

So for all tungsten filament lamps and for combined loads of tungsten filament and non-inductive lamps, a "T" rated switch must be used. If you wish to use any other type of switch for these types of load, then the three qualifications as outlined in paragraph "b" must be satisfied.

For non-inductive loads the switch must be rated for the load as outlined in paragraph "a".

For inductive loads the switch must have twice the rating of the load except for a type which is approved as part of an assembly or for the purpose employed as outlined in paragraph "c".—B.Z.S.

T and TW In Raceways

I would like to add a few comments with reference to Questions on the Code, January 1954 issue; subject pulling T and TW wire in raceway question by P.P.G. answered by B.A.McD.

Since early in 1941 we have been using plastic T and TW insulated wires sized from 16 to 6 inclusive.

We have used and reused thousands upon thousands of feet and no other in wet, cold and hot, up to 200 degrees F. locations, and have had no shorts, breaks or grounds.

All conductors are stranded. We use squeeze type terminals and connectors. Due to the over-all size we can run more conductors per raceway. When pulling, we use soap water or soapstone as lubricant.

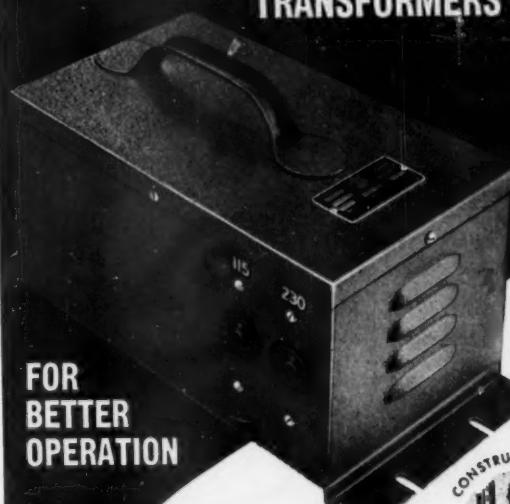
The extra cost of stranded wire and solderless terminals is more than offset by ease of pulling wires, ability of reusing even after years of service on other installations, no chance of breakage due to nicked conductors, etc.

Color coded T and TW wire will not lose its color after years of service.

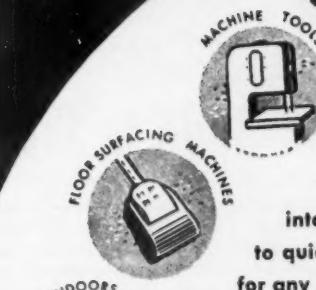
We believe that P.P.G. is trying to use solid conductors; that is why he is having this trouble. We pull wires around 3-90° bends without injury or difficulty. The writer is in defense of the above mentioned wire and will use no other type.—S.R.K.

GIVES SAGGING VOLTAGES a LIFT...

MARCUS PORTABLE BOOSTER TRANSFORMERS



FOR
BETTER
OPERATION



Wherever voltage drop is encountered, the Marcus Portable Booster Transformer can be easily plugged into any line—either indoors or outdoors—to quickly restore necessary voltage level. Ideal for any application where appliances or machines are not operating at top efficiency due to low line voltage. Equipped with voltage input receptacles for 95 - 105 - 115 - 208—to deliver 115 and/or 230 volts in any combination.

IN	OUT
95	115
105	115 or 230
115	
208	

With a capacity of 3000 watts or 3 KVA, the Marcus Portable Booster Transformer has exceptionally high dielectric and thermal stability. It is wound with silicone enamel magnet wire and has twist-lock plugs for safe connections. Made in crinkle gray steel finish, one unit can handle two $\frac{1}{4}$ ton room air conditioners.

"Mark of Quality"



Representatives in Principal Cities

MARCUS
TRANSFORMER CO., Inc.
RAHWAY, NEW JERSEY

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF DRY TYPE TRANSFORMERS EXCLUSIVELY

thousands already using it to help Plan Better Industrial Lighting...



HELPS PLAN

Thousands of architects are using it to help them plan the type and kind of lighting systems which will best fit the particular industrial building they are designing. They also use it to show their clients the reasons why the recommendations call for RLM-certified units.

HELPS BUY

It gives buyers by the thousands, such as industrial executives, operating chiefs or plant maintenance heads, dollars-and-cents reasons why RLM-labeled lighting units are the best buy in terms of quality, performance and sustained high lighting efficiency.

HELPS SELL

It enables thousands of electrical contractors, electrical wholesalers, etc. to point out to their customers EXACTLY WHAT THEY ARE GETTING for their lighting dollar. It shows why the RLM Label on a lighting unit takes the place of over 1,500 words of specifications!

HELPS RECOMMEND

To thousands of purchasing agents it serves as a valuable yardstick in their evaluation of industrial lighting... an accurate guide to sound recommendations based on a comparison of the merits of different lighting units. It tells them what to look for and how to estimate lighting equipment value.

HELPS SPECIFY

To thousands of lighting men whose job it is to specify lighting units, it puts at their fingertips 27 different RLM Specifications, many complete with light distribution curves and coefficient of utilization tables. All are ready-made for use when drawing up lighting plans, layouts or recommendations.

R-352

This newly-revised "Blue-Cover" edition of the RLM Specifications Book of Industrial Lighting Units has just been made available to everyone who buys, sells and specifies industrial lighting equipment. Already thousands of copies have been requested and put to productive use in the planning of better industrial lighting.

NEW "UPWARD LIGHT" UNITS

In case you have not yet sent for your copy, be sure to do so before the supply is exhausted. This latest "Blue-Cover" edition of the RLM Specifications Book has been expanded to 52 pages, covering over 83 sizes and types of RLM-certified industrial lighting units. Featured are new specifications which embrace 15 variations of three new "Upward Component" RLM Semi-Direct Fluorescent Units

which direct from 20% to 30% of the light upward. Also incorporated are important revisions and clarifications of existing specifications including new tables of typical coefficients of utilization and lighting distribution curves.

A request on your letterhead will bring you copy of this new RLM Specifications Book, as well as the pocket-size "RLM Questions and Answers" booklet, by return mail, without cost or obligation. Send now for this invaluable reference work to help you plan better industrial lighting!



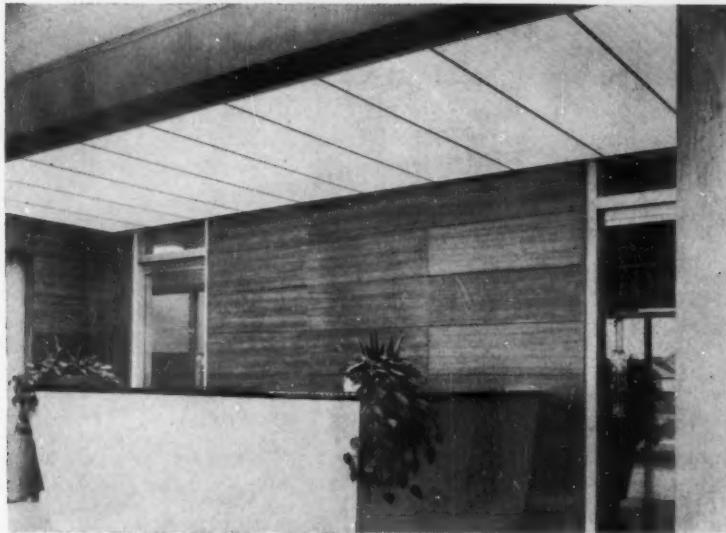
RLM Standards Institute,
Suite 819, 326 West
Madison Street, Chi-
cago 6, Illinois.



RLM STANDARDS INSTITUTE

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

Modern Lighting



Louverall Ceiling Lights Reception Desk

A louverall ceiling directly over the reception desk in the Parto Depot of the Ford Motor Co., Melrose Park, Ill., produces an interesting and highly pleasing lighting effect. This ceiling consists of ten louver panels each 24 inches wide by 6 feet 8 inches long, and covers 125 square feet, supported by T-frames side by side.

The louverall panels consist of molded polystyrene louvers having 1-inch by 1½-inch apertures, providing a 45-degree by 35-degree shielding cutoff. These panels are installed 30 inches from the main ceiling and may be lifted from the frames for maintenance or relamping.

Slimline lamps are installed in the plenum above the louvers on 12-inch

centers, 18 inches above the louvers. This arrangement provides a lighting level of 100 footcandles of uniform and glarefree lighting.

The reception room proper is lighted by a system of rectangularly shaped patterns of recessed troffers, which combine with the louverall section to produce a pleasing arrangement of modern lighting elements.

This lighting installation, consisting of Electro Silv-A-King equipment, was installed by Hultgren Electric Co., electrical contractors. The equipment was supplied by electrical distributors Effenegge Electric Company, Chicago. Architects and electrical engineers for the building were Giffels & Valet, Inc., of Detroit.

Motel Attracts Tourists With Light

Light has been used most effectively as a decorative as well as a utilitarian medium at the Kay-Lyn Kourt, near the city limits of Richland, Georgia. Light has made this 20-unit, air conditioned motel a thing of beauty. It also serves as an advertising medium by attracting the attention of tourists driving along the nearby highway, and provides illumination at the entrance of each of the 20 guest units.

The lighting objective was to floodlight the building to make the attractive brick facade stand out brilliantly in the night, and stop customers—motoring tourists. This objective has been achieved most effectively.

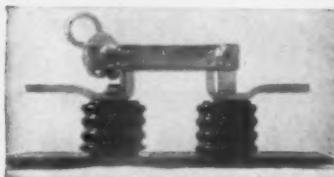
The building consists of a two-story central section with 1-story units on either side. A covered walkway extends along the entire front.

Two 1000-watt Revere enclosed-type floodlights, installed on the ground in front of the building, floodlight the center section. Continuous neon tubing was concealed behind a continuous beam at the front of the walkway roof, floodlighting the entire front of the building.

The result is that the entire front of the building is flooded with light, and stands out brilliantly in the night as there are no surrounding lights in the background to detract and compete with this lighting. Also, the color contrast between the incandescent light on the central section and the neon lighting on the face of the building under the walkway roof adds to the effectiveness of the installation. All light sources are concealed, and



FLOODLIGHTING from concealed sources creates artistic and tourist-stopping effect at Kay-Lyn Kourt, Richland, Ga., 20-unit motel which is air conditioned throughout.



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Designed for use on loads too heavy for one-hole Jiffy clips. Made of all new zinc plated tempered steel to give strength and rigidity enough to support heavier pipes, cables, conduits, etc. Available in sizes to fit pipes and conduits from 3/4-in. to 1-in. Can also be had in Everdur, copper, brass or aluminum.

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MINERALLAC

only reflected light from the building front is visible.

Motorists slow down almost automatically as they approach this motel; this can be attributed to the startling beauty of the lighting effect. One Richland citizen commented that this spectacular effect is "the best traffic control the town has ever had."

The lighting and electrical systems were installed by electrical contractor E. C. Turner. Melvin Hunt, lighting engineer for the Georgia Power Company, designed the lighting system, and Hugh K. Marshall, East Point, Ga., was the architect for the entire project.

Slimline Troffers Light Auditorium-Gymnasium

Paine College, a progressive school for Negroes in Augusta, Ga., boasts of something a little out of the ordinary in lighting for a multi-purpose building. It has a three-intensity lighting system, using slimline fluorescent lamps in surface troffers of the 3-lamp louvered type, supplemented by incandescent lighting for special lighting purposes.

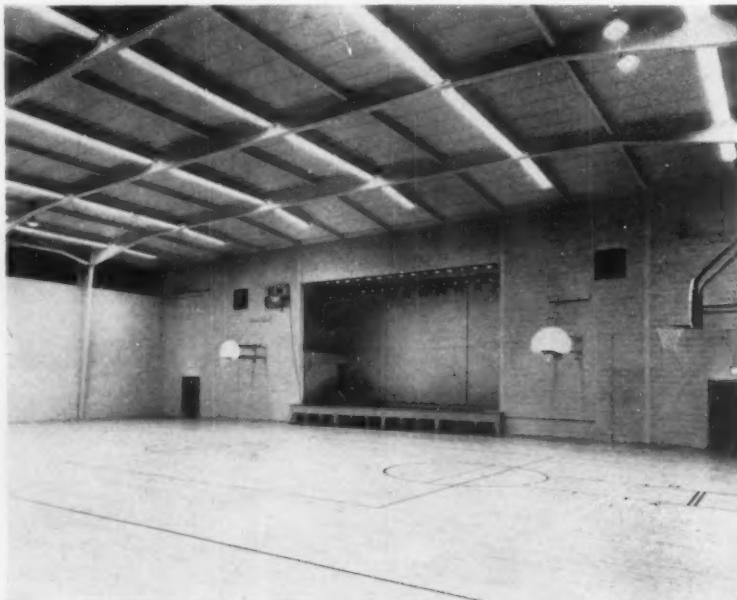
This multi-purpose building is used as an auditorium for plays, concerts, etc., as a gymnasium for sports and physical education, and as a social hall for dances and civic events. It is 130 feet long by 102 feet wide, with an approximately 23-foot high ceiling. The gym play area is 76 feet by 102 feet. It has a permanent balcony on one side, and uses removable seats on the main floor for auditorium events.

In designing the lighting, it was necessary to maintain a neat appearance and a high ceiling without obstructions which would interfere with sports activities. Also, the structural design of the beamed ceiling had to be considered. From the lighting design standpoint, it was desirable to provide flexibility of lighting intensi-

ties to meet the varied lighting requirements.

All of these lighting objectives were solved by selecting 3-lamp continuous row DayBrite troffers which were surface-installed on the bottom of small beams running at right angles to the heavier support beams. These troffers were selected for F96T12 slimline lamps and equipped with specially designed, hinged, egg-crate type louvers which act as guards for the lamps in addition to providing shielding against glare.

Three 2-lamp ballasts control the six slimline lamps in each 16 feet of troffer, with one ballast operating the two center lamps of each 16-foot length. The center lamps are controlled by one switch, and the outside lamps by another. This provides three levels of lighting, suitable for the multiple purposes for which the building is used. Soft white fluorescent lamps are used as the center lamps in troffers in the center bays only, which provide appropriate low level lighting for dances and similar events. With all lights turned on, the entire area is flooded with 35 footcandles of diffuse, shadowless lighting suitable



FLEXIBLE LIGHTING from 3-lamp troffers provides three levels of illumination for the Randall A. Carter auditorium at Paine College, Augusta, Ga., used also for sports and social events.



A
PHILLIPS SHOES

architect: THEODORE ROGOVY, detroit
SERIES RS 2828 (above) in main area supplemented by a louvered ceiling using SERIES RS 7084. Illumination—50 f.c.



B

S. S. KRESGE CO.

SERIES SL 5293 with incandescent spots in main area; SERIES SL 1500 (above) in adjacent area and offices; SERIES SL 7062 in windows. Illumination—100 f.c. in store areas; 40 f.c. in offices.



F

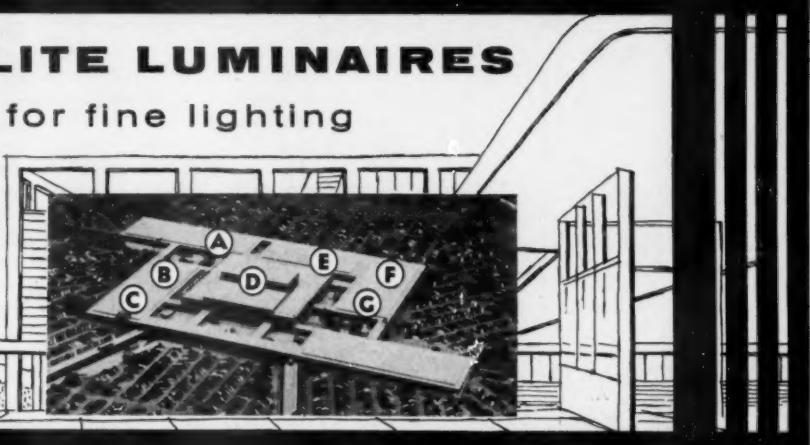
ZUIEBACK'S

architect: MAXWELL WRIGHT, detroit
SERIES 3838-3A (above) plexiglas shielded for general lighting to supplement incandescent accent lites. Illumination—50 f.c.

RUBY-PHILITE LUMINAIRES

...first choice for fine lighting

IN NORTHLAND CENTER



C

A. S. BECK SHOES

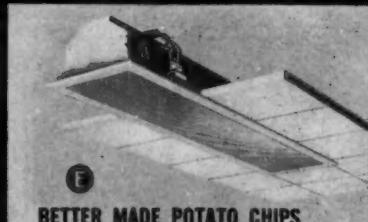
architect: CHARLES SPECTOR, new york
SERIES 7062 (above) supplemented by SERIES 2828 and incandescent downlites. Illumination—50 f.c.



D

HUDSON'S NORTHLAND

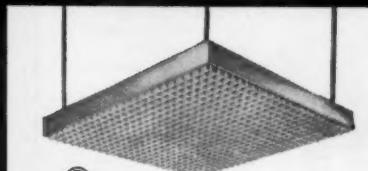
architect: VICTOR GRUEN, detroit
SERIES TD (above) supplemented by SERIES MOTD for many different service areas throughout the store. Illumination—75 f.c.



E

BETTER MADE POTATO CHIPS

architect: VICTOR GRUEN, detroit
interior: JEROME SCYMASZEK, gen'l mgr.
SERIES SL 25-7 used throughout to obtain 40 footcandles average illumination.



G

BAKER'S SHOES

architect: EMIL FOREMAN, st. louis
SERIES 5858 (above) in main area with varied supplemental general and accent lighting. Illumination—50 f.c.

Ruby-Philite luminaires are installed in so many stores in Northland Center that it can serve as a Ruby-Philite showroom. This overwhelming preference was earned by an ability to supply required illumination with minimum luminaires . . . without sacrifice of architectural design or comfort . . . in sites ranging from high-fashion shops to work areas. You, too, will find it easier to gain better solutions to your lighting problems when you consult a Ruby-Philite catalog. Send for your copy today.



Ruby-Philite Corp.

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IN 15" OR 18" SIZES

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New one-piece self-centering bit chuck makes this machine the best you can buy. High-speed: takes bit thru level holes in the toughest joist. Adjustable 4½ to 13½ ft. Built for tough, rugged service. Simple to use. Write for catalog TODAY.



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Wire Pulling Lubricant

Only Y-ER EAS has all these features

- Creamy, non-corrosive lubricant. Never greasy or messy.
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GIVES THE SLIP TO—

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Improved Y-ER EAS tested and approved by the Underwriters' Laboratories, Inc.

AT ALL LEADING ELECTRICAL SUPPLY HOUSES



ELECTRO COMPOUND CO.
5919 W. 150th St., Cleveland 11, Ohio

for all sports games played here.

Twin 500 watt semi-concentrating incandescent reflector units highlight the baskets for the basketball court. Two concentrated projector spots are concealed behind the first beam in front of the stage, and are used to flood the stage with white light.

A stage recessed in one wall has disappearing footlights, two rows of borderlights with color lenses, and one

row of floods for back wall lighting, with convenient stage plugs for side floodlights. Stage lighting is Hub Electric Company equipment.

Carter Electric Company of Augusta was the electrical contractor for this building. The lighting was designed by Walter S. Smith, Jr., of Georgia Power Company's Augusta office. Kuhlke & Wade were the architects for this project.

Mercury Vapor In Industrial Hi-Bay

An extensive installation of hi-bay mercury vapor lighting is one of the many outstanding features of electrical construction in the new ultra modern, Columbus, Ohio, plant of the Westinghouse Electric Appliance Division. This modern lighting application provides an average maintained lighting intensity of 50 footcandles in the shear and press area of the plant, which is now manufacturing refrigerators. In this area, sheet steel is cut to size on shears (foreground in photo) and drawn, formed, trimmed or notched on presses (in the background). The available lighting is well suited to the visual tasks involved.

As shown, the lighting fixtures are suspended from outlet boxes on the ceiling and hang between the steel roof trusses which span the 100-foot wide area. Ten-ton bridge cranes operate in the 100-foot bays which are 40 feet high to the bottom of roof steel. The aluminum reflectors are stem mounted at a height of 39-ft. 10-in. from the floor. To assure plumb hanging of the

fixtures, spring ball and socket connections are made between the hanger stems and the ceiling outlet boxes. Ball and socket suspension further reduces the effect of vibration on lamp life. Fixture spacings are: 13-ft. 4-in. from front to rear of photo; 22-ft. from left to right of photo.

The relatively close spacing of the mercury vapor high bay fixtures is particularly advantageous in that it affords sufficient overlapping of the light beams at the working level to avoid disturbing shadows when the traveling crane is overhead.

Each fixture is equipped with one 400-watt, type J-HI, fluorescent mercury vapor lamp. On the working level below, each lamp illuminates about 300 square feet.

Wiring of the complete plant was done by the Dingle-Clark Company, electrical contractors, Cleveland, Ohio.

The electrical plans were prepared by Ebasco Services Incorporated, New York, who were also general contractors for the entire plant.



Critical Seeing Job of metal shearing (foreground) and stamping (background) shops is met by fluorescent mercury vapor high bay fixtures with 400-watt J-HI lamps. Maintained intensity is 50 footcandles.

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HERE'S A REALLY INEXPENSIVE breaker-type main disconnect—the dependable Federal Noark® Enclosed AB Type Breaker. It gives you the choice of 2 pole, 70 or 100 amp., NE Frame, 250 volt breakers for the following applications:—As a main service entrance breaker in homes, shops, service stations, stores, etc.; As a main disconnect for lighting panels, small power panels, and single phase heating loads.

Enclosed Type AB Circuit Breakers are available in both the unique, combination flush-surface general purpose enclosures and in the

special, easy-to-mount raintight enclosures.

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ENCLOSURES		Amps.	Poles
General Purpose	Raintight		
1027	R1027	70	2
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Also available in 70 and 100 amp. 3 pole devices.

For top dependability and dollar savings, order Federal Noark Enclosed AB Breakers from your Federal Distributor.

FEDERAL ELECTRIC PRODUCTS COMPANY

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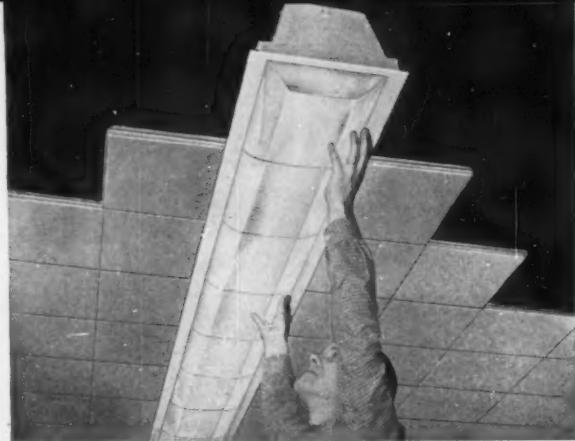
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New Product



Functional troffers installed to form unbroken line of light



LPI troffers give architects complete freedom in planning lighting arrangements

New troffers, designed and built by Lighting Products, Inc., can be installed glass to glass to form a line of light unbroken by dividers. These troffers are adaptable to any known form of ceiling, and offer a wide selection of shielding media, including metal and plastic louvers, Holophane lenses (flat and curved), Albalite glass (flat and dished), and dished Plexiglas. All are interchangeable in the LPI troffer frame. This frame is quickly and easily slipped into place (no tools required) and is secured by a stable floating hinge, hidden from view. This eliminates the need for screws or other fastening devices which would mar the neat, clean appearance of the trim.

The unitized boxed construction of the LPI troffer body results in exceptional rigidity and assures perfect alignment in long runs. Engineered to prevent light leakage, the LPI troffer will accommodate from one to four lamps (preheat, rapid start, and slimline). It requires less than 8 inches in the ceiling and is suspended by LPI's patented Flexahanger which permits the contractor to install and adjust the troffer with complete accuracy. All lengths are standardized—24", 48", 72", and 96". They come in 12" and 24" widths.

For additional information and literature write Lighting Products, Inc., Dept. 4A, Highland Park, Illinois.

No screws or other devices mar the appearance of the troffer trim



In The News

NISA CONVENES IN DETROIT

Motor shop operators review technical and management problems; see new products; elect G. E. Jones president.

Informative formal papers and lively open forums highlighted the 21st Annual Convention of the National Industrial Service Association at the Hotel Statler in Detroit, June 13-17. More than 700 members and guests attended the highly interesting sessions on shop and management subjects, studied new equipment ideas in a large product exhibit, and enjoyed the relaxation of a full social program.

Robert C. Parks, assistant sales manager, Howell Electric Motors Co., Howell, Mich., opened the technical sessions with a detailed explanation of the new NEMA Rerating Program. Mr. Parks revealed that the new motor lines of all manufacturers will basically double the horsepower rating for approximately the same diameter frames. "Bearing sizes have not been standardized and will be selected by various manufacturers to suit their particular needs. Shaft diameters and lengths, as well as keyways, are stand-

ard for all companies," he advised. Under the new program, enclosed motors (which are fan-cooled) are no larger in diameter than open motors, Parks noted. The new motors will meet present NEMA standards, he added.

The subject of ball and sleeve bearings in motors was given an exceptionally thorough review by Wilbur C. Thompson, general sales manager, Detroit Ball Bearing Company. Mr. Thompson cautioned against the use of a blow torch flame to expand a bearing for assembly in the motor, recommended a hot oil bath or an oven. The latter is preferred since it is cleaner, can be more easily controlled, and presents less chance of bearing contamination. The best temperature is between 200° and 225° F., he noted. He cautioned shop men and users against overlubrication of motor bearings. Keeping the grease cavity filled to not more than one-third

capacity is a safe rule. Filling to capacity leads to trouble, particularly at high speeds. The rotating retainer, with its balls and rollers, beats the lubricant and generates heat. Instead of dissipating heat, the lubricant adds heat to the bearing assembly resulting in expansion that may tighten and destroy the bearing, Thompson explained.

Commutators can be repaired with a certain degree of subsequent service dependability if the proper consideration of the construction is taken into account and a definite work technique developed, Cecil R. Medsker, manager, repair department, Miller-Seldon Electric Co., told the convention. After discussing details of commutator repairs, Medsker noted that all repaired commutators should be seasoned to overcome stresses imposed by operational heating and inertial reaction of rotation. To do this, subject the commutator to a sustained baking period of 12 hours at 300° F. Then rotate the commutator at least 10% above its normally highest operating speed while hot. Then machine the brush surface, Medsker advised. Watch out for mica feathers or flakes protruding from



NEW NISA OFFICERS: President—G. E. Jones, G. E. Jones Electric Co., Amarillo, Texas; vice president—Joseph H. Previty, Penn Electric Motor Co., Philadelphia, Pa.; secretary—Charles J. Covington, Dowzer Electric Machinery Works, Inc., Mt. Vernon, Ill.; treasurer—C. R. Durand, H. N. Crowder, Jr., Co., Allentown, Pa.



NEW DIRECTORS OF NISA are Murphy G. Miller, Tennessee Electric Motor Service, Knoxville, Tenn.; T. M. Paul, Paul Electric Company, Sioux City, Iowa; Paul Sievert, Sievert Electric Company, Chicago, Ill.

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Insulating Foursome

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thin . . . strong . . . flexible . . . 150% stretch

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DUTCH BRAND Plastic Tape is thin but strong . . . flexible with 150% stretch . . . dielectric strength resists 1000 volts per mil of thickness . . . withstands weather and resists oils, acids and corrosive chemicals. It is available in all widths . . . in .007" thickness or heavy duty .010" and .020" thickness for heavy duty work . . . for use with power driven tape machines. It is available at your Electrical Wholesaler. For top quality be sure to specify DUTCH BRAND when you order.

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DUTCH BRAND FRICTION TAPE

DUTCH BRAND Friction Tape is well known for quality for over forty years. It is free of pin holes . . . has correct adhesion . . . has long life and stands up on the job. Dielectric strength is 2000 volts for a single thickness.



DUTCH BRAND RUBBER INSULATING TAPE

Resists up to 18,000 volts through a single thickness. It fuses instantly without heat . . . contains no corrosive chemicals . . . has long life and is dependable. This tape serves a very definite non-replaceable service under electrical codes meeting electrical insulating requirements.



DUTCH BRAND "DB" WIRE CONNECTORS

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LEFT TO RIGHT—David Sandman, Sandman Electric Co., Boston, Mass.; William J. Wheeler, Sr., The Maintenance Co., New York City; Arthur J. Lott, Orlando Armature Works, Inc., Orlando, Fla.; Frank Silveria, Frank Silveria Electric Co., Gustine, Calif.; Carl F. Benfield, Piedmont Electric Repair Co., Lexington, N. C.; D. H. Short, Piedmont Electric Repair Co., High Point, N. C.



LEFT TO RIGHT—W. E. Laycock, Laycock Armature Works, Inc., Tampa, Fla.; L. J. Whitted, Clinton Electric Motors, Clinton, Iowa; W. E. Brunson, Jr., Sumter Electric Rewinding Co., Sumter, S. C.; John R. Guest, Tifton Electric Motor Shop, Tifton, Georgia; R. J. C. Fletcher, Electric Machine & Repair Co., Beaumont, Texas; R. A. Scherer, Scherer Electric Co., Indianapolis, Ind.; Clark M. Phippen, J & J Armature Works, Beaumont, Texas.

the end of commutator segments adjacent to the vee ring. This means poor bonding in segment mica, he cautioned.

Having an array of test equipment in a shop is not enough to do a thorough test on motors, according to Howard Davies, Howard Davies, Inc., Philadelphia. You must have a knowledge of at least the characteristics of the motor under test (as specified by NEMA or the manufacturer) or the test data of each motor as furnished by the manufacturer. After detailing numerous test techniques, he emphasized the importance of the final dynamometer test before a repaired motor leaves the shop.

Characteristics of new insulating materials with higher temperature limitations, less physical bulk and easier handling qualities were outlined by Grover Brown, field engineer, National Electric Coil Co., Columbus, Ohio. Among those covered were Silastic tapes, silicone wire enamel, Mylar insulations, Teflon, new asbestos-glass silicone-treated laminates, and polyester resins. All are of interest to shop operators who are searching for insulations with better dielectric qual-

ities and high temperature resistance.

The shift from conventional motors to stator or rotor assemblies as used in hermetically sealed refrigeration units marks an important transition in the motor industry, B. L. Britt, manager, electrical service department, Wagner Electric Corp., St. Louis, told the delegates. Unless motor repair shops equip themselves to handle this type of work, they stand to lose a good part of the refrigeration motor repair business, he warned. Repair of motors of this type used with Freon F12 and F22 refrigeration systems require extreme care and cleanliness. For rewinding these units, Britt recommended the following procedure: Cold-strip the stator and clean with compressed air; insulate slots with special purified insulating paper; use wedges of special purified, hard, gray, vulcanized fibre, use only heavy Formvar wire for coils; wind and tie stator tightly; use purified cotton for sleeving leads, for tying coils and on flexible stator lead cable. Britt suggested shop operators secure assurance of their suppliers that insulations ordered are satisfactory for use with refrigerants

with which motor is used.

Fractional horsepower motor repairing can be profitable, if the shop is streamlined specifically for that type of operation, according to Joseph H. Preuity, Penn Electric Motor Co., Philadelphia. Preuity's blueprint for a successful operation includes a streamlined, uncluttered shop with plenty of working space for mechanics and a layout that permits changes without disrupting the entire shop. Winding and assembly departments should be separated from each other. There should be an orderly sequence of operations and shop design should permit future expansion. Production records in the Preuity shop prove the efficiency of his layout. During 1953, some 17,170 motors up to and including 3-hp were repaired at the rate of 0.802 motors per man-hour.

Walter G. Brush, Electric Motor Service, Inc., Birmingham, Ala., concurred with Preuity on the need for shop efficiency. Since labor is the most expensive item in motor shop operations, it should be conserved by doing the job with fewer man-hours, or increasing productivity by use of more

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and Double Grip Contacts



- **EASY TO WIRE** — No wire loops to make. No screws to run down — a few seconds and connections are made. Time studies prove labor costs run from 4¢ to 5¢ less per outlet.
- **PRICED RIGHT** — Priced low — giving you an easy-to-wire, double grip outlet that can be used profitably on practically any job, large or small.

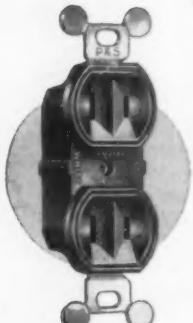
High quality phosphor bronze springs hold wires firmly — far exceed "pull" requirements of Underwriters' Laboratories. Vibration will not loosen them.

Double, torsional contacts of phosphor bronze give perfect, long line contact with minimum of heat — which means long life.

Strap runs through outlet and is fastened rigidly at both ends, producing a perfectly insulated back for greater safety. Plastic parts are extra sturdy. P&S 1500 has easy-find slots and washer type plaster ears — is designed for use with No. 12 and No. 14 solid wire.

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1500
OUTLET



SAVES TIME

Just 2 Things To Do



1

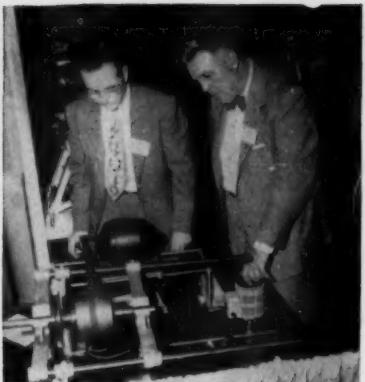
Strip wires to gauge molded in back of outlet.



2

Push wires into wire holes and they are anchored securely.

Listed as approved by Underwriters' Laboratories Inc.



LEFT TO RIGHT—Charles E. Howard, Howard Electric Co., Detroit; O. G. Werner, Werner Electric Co., Detroit; J. R. Horton, Daley Electric Co., Phoenix, Ariz.; J. M. Young, Anderson Young Electric Co., Lubbock, Texas; Gerard E. Dandurand, North-eastern Electric Co., Boston, Mass.; Hector Munro, New England Machine & Electric Co., Pawtucket, R. I.



LEFT TO RIGHT—George Holden, H. A. Holden, Inc., Minneapolis, Minn.; Frank W. Ross, Ross Electric Motor Shop, Fairmont, Minn.; J. M. Pilmer, Electrical Engineering & Equipment Co., Des Moines, Iowa; Wm. S. Giles, Giles Armature & Electric Works, Inc., Marion, Ill.; Mark T. Moore, Industrial Electric Service, Inc., Kearney, Neb.; J. G. Peterson, Electric Apparatus & Repair Co., Philadelphia, Pa.; John W. Overton, Electric Motor & Repair Co., Richmond, Va.

labor-saving equipment. If real savings are to be realized, both of these phases must be kept in mind, Brush noted, as he continued to list numerous ideas and gadgets he used to achieve this end.

Management Subjects

M.G. Miller, Sr., Tennessee Electric Motor Service, Knoxville, tackled the question "How do you stack up?" as a motor repair shop. From the NISA membership list of approximately 1313 shops, he learned that 1,171 are small shops. Some 414 of these small shops designate their small motor department as one of their two most important activities, with many having no other activity except for a few small sales items. Only 142 association members have no small shop at all.

Miller asked 13 of the most successful small shop operators for data to establish some sort of a yardstick for similar shops. Here is what he found out. The business area for the average shop covers a 100-mile radius. Ten of the 13 shops do minor repairs and wind field coils for small power tools. No one does a complete tool repair job.

Average labor cost, including foreman, runs $36\frac{1}{2}\%$ of gross service sales; material costs are $29\frac{1}{2}\%$ of gross service sales. Production averages 3 motors per man per day. Advertising expenditures range from .005% to 1.8% for most shops contacted. Of the 13 shops surveyed, 10 are using or favor an incentive plan and 3 are cold to the idea.

The subject of incentive plans was pursued on a broader plane by Frank Willey of Cincinnati who discussed the survey made by the NISA Committee on Incentive Plans. Out of 356 replies (a 27% return) 67 shops indicated they had plans in operation, 11 of them prior to 1942. Of the 67 plans reported, 58 were classified as successful. Operation of an incentive plan with a shop union contract in force was indicated by seven reporting shops. Out of the 356 replies, 103 indicated a shop union contract. Some 51 shops reporting indicated an intention to set up an incentive plan. In general, they were looking for one which was easy to understand, equitable between all employees and employers, required a minimum of bookkeeping, and was easily adjustable for various shop con-

ditions. The committee feels that incentive plans can tap an inherent source of accomplishment; can create a better and more logical relationship between worker and owner. Principal plans under consideration are profit sharing or a bonus in some form.

The importance of records and accounting to obtain the necessary information (assets, costs, selling price, profit) to operate a successful business was emphasized by Albert J. Abbott, Canadian General Electric Co., Ltd., Toronto, Canada. With a competitive market developing after 13 years of high level prosperity, Abbott feels the time has come for self-appraisal and critical examination of those factors which make for long range success. This means finding out which products and services are most profitable, which should be dropped, which department operations are most efficient and why. Information of this type can be secured by establishing accounting controls for purchasing, inventories, billing, departmental overhead, budget expenses and sales, detail costing, credits and collections. Your accountant can be one of your best assets, Abbott concluded.

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RELIANCE TIME SWITCHES



JUDGING NISA AWARD entries—George Larsen, Larsen-Hogue Electric Co., Los Angeles, Calif.; Paul Sievert, Sievert Electric Co., Chicago, Ill.; James Steffner, Chattanooga Armature Works, Chattanooga, Tennessee.

Selling in the motor repair shop has suffered most in recent years, according to Harold Bongarten, Detroit Service Shop, General Electric Company. Although shops have not replaced salesmen, the last six months has seen an increased interest in this phase, and sales training programs have been revived in many cases. To sell the buyers' market, he suggested the revival of prewar sales tools plus new ideas. Sell quality over price and use functional salesmen—those who know shop techniques and have practical application knowledge, he advised.

Selling labor in the form of repair sales appears to be more profitable than selling merchandise. This was a conclusion reached by the NISA Sales Survey Committee based on an analysis of 59 reporting shops (most in the \$200,000 and over volume class). Percentage-wise, raw costs of labor and material was 67.1% of the sales dollar (21.4% material; 45.7% labor) in 1953. Overhead averaged 25.7% and profit before taxes averaged 7.2%. An interesting comparison was the 6-year average covering 1946 through 1953. Here, material ran 26.6%; labor, 40.02%; overhead, 25.77%; and profit before taxes, 6.57%. Operating overhead, housing, transportation and administrative overhead remained fairly consistent over that period, the report revealed.

Think of your business in terms of the possible liabilities you may incur, H. William Butler, Detroit attorney, advised shop owners. Chances are that you will then protect yourself against possible contingencies. Butler, a member of the firm of Clark, Klein, Brucker & Waples, is legal counsel to a number of Detroit motor shops. He discussed the ramifications of the Fair Labor Standards Act, Taft-Hartley Act, and other business controlling legislation,



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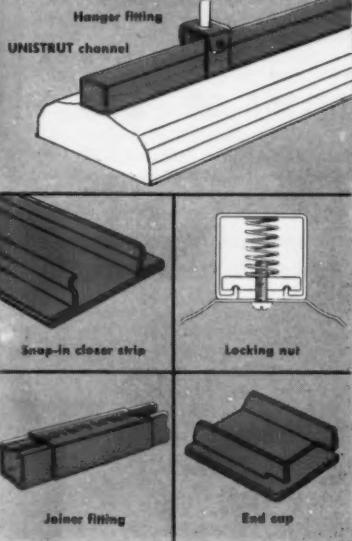
New fluorescent fixtures were recently installed on two floors of the Butler Brothers Building, Chicago, Illinois. The savings on this UNISTRUT installation over conventional methods was estimated at fifty percent. How did UNISTRUT reduce installation costs?

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UNISTRUT channel insures true alignment. It provides the utmost in safety because the entire row of fixtures forms a single integrated unit. Fewer hanger rods are needed and a neater, more attractive installation results. Stems or rods may be placed at any point

Here are the simple, component parts of the UNISTRUT light supporting system



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Liabilities under proprietorship, partnership, and corporate forms of business were outlined. Product and service liability, guarantee and warranty were defined and explained in a forum session. As a protection to shop operators, where no union has jurisdiction, Butler advised management to compile employee manuals which spell out all working rules.

Business Session

Association accomplishments during the past year were reported by retiring president Wm. M. Hogue, Los Angeles, and executive-secretary Fred B. Wipperman, St. Louis, at the annual business luncheon.

A resolution passed at this session urged NISA to recommend to appropriate Federal agencies that the liberalized depreciation provisions under the proposed revision of the Internal Revenue Code be revised to apply equally to both used and new assets. NISA feels that confining liberalized depreciation to new assets only, would be discriminatory against purchasers and users of reconditioned and used equipment assets.

New officers presented at the session include; president—G. E. Jones, G. E. Jones Electric Co., Amarillo, Texas; vice president—Joseph H. Preuity, Penn Electric Motor Co., Philadelphia; secretary—Charles J. Covington, Dower Electric Machinery Works Inc., Mt. Vernon, Ill.; treasurer—C. R. Durand, H. N. Crowder, Jr., Co., Allentown, Pennsylvania.

New members of the Board of Directors include: Murphy G. Miller, Tennessee Electric Motor Service, Knoxville; T. M. Paul, Paul Electric Co., Sioux City, Iowa; and Paul M. Sievert, Sievert Electric Co., Chicago.

Award Contest Winners

A group of three judges chosen from convention delegates reviewed some 90 entries in the annual NISA Awards Contest. The following winners were selected by George Larsen, Los Angeles; Paul Sievert, Chicago; and James Steffner, Chattanooga.

1st Prize—\$100—to Peter Mackey, White Electric Service, Lowell, Mass., for a simple wax form developed to wind solenoid coils.

2nd Prize—\$75—to C. D. Bonner, Egle-Trobaugh Electric Co., Memphis, Tenn., for his "live" center for a pulley puller.

3rd Prize—\$50—to Claude C. McLean, Scherer Electric Co., Indianapolis, Ind., for his adjustable all-metal armature rack.

4th Prize—\$25—to Hector Robege, H. Robege Co., Quebec, Canada, for an improvement on a 60-ton vertical press.

Honorable Mention awards of \$10 each went to the following; Wilber Hemminger and Joseph Greigo, Larsen-Hogue Electric Co., Los Angeles; L. J. Schmitt, Warwood Armature Works, Wheeling, W. Va.; A. R. Adams, Powerite Electric Motor Co., Austin, Minn.; Robert Borschel, Kenmore, N. Y.; Paul Golick, Vancouver, B. C.; Toll-Morris Electric Co., Vondom, Ont.; Roy Van Ottingham, Electric Motor Service Co., Salem, Oregon; Wheeler Service, Cambridge, Mass.; Industrial Engineering & Equipment Co., Davenport, Iowa. Thomas M. Russell, Russell Electric Co., Mobile, Ala., was chairman of the Awards Committee.

Future NISA convention cities will be Los Angeles, 1955; Philadelphia, 1956; and New Orleans, 1957.



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AT LAKE PLACID attending meeting of District One, NECA, were (left to right) Roy J. Knoblock, Krause & Heil, Inc., Syracuse, N. Y.; W. F. Taylor, W. L. Schoonover & Co., Newark, N. J.; Alfred V. Bartlett, Sr. (Vice President NECA), Rust Electrical Co., Inc., Providence, R. I.; P. Joseph Quinn, Manager, New Jersey Chapter, NECA; C. P. Hansen, Peifer Electric Co., Trenton, N. J.; and James McKinnes, Watson-Flagg Engrg. Co., Paterson, N. J.

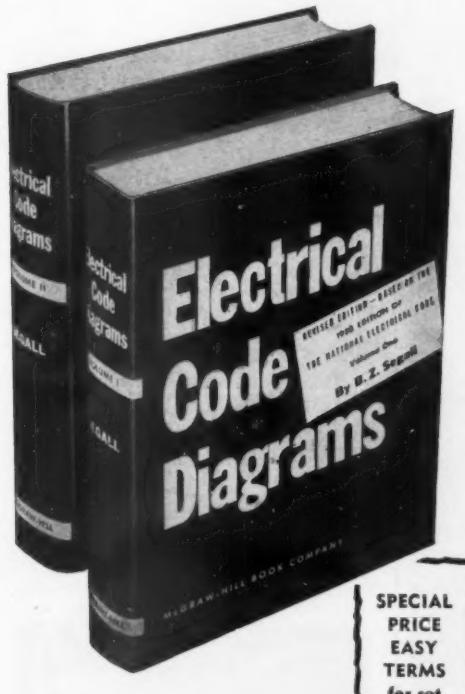
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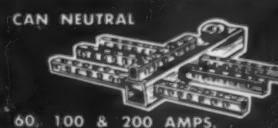
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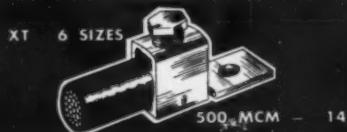
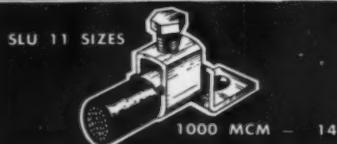
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District One NECA Met in Lake Placid

About 200 attended the 8th annual meeting of District One of the National Electrical Contractors Association, Inc., held at the Lake Placid Club, Lake Placid, N. Y., on May 20-22. Members and guests came from New York, New Jersey and the New England states.

A. V. Bartlett, Sr., vice president of NECA, reported on the various programs of NECA including the business development; labor relations; adequate wiring; research and apprentice training. He stressed the importance of the field service work and felt that this activity should be expanded rather than curtailed.

In Paul Geary's absence, C. J. Harder, treasurer, outlined the educational program developed by NECA, which is designed to increase the volume of profitable business for electrical contractors; eliminate unethical practices and raise the general standards of the industry. He stressed the importance of full cooperation in this program at the chapter level, stating that chapters are not actively participating in this program. Harder said that NECA has 300 members out of a total 11,000 firms in the United States who perform the functions of electrical contractors in that they are recognized as regular employers of electrical construction workers. NECA members account for some 60% of the payroll, general contractors 6% and non-member contractors 34%.

The business development program and the national institutional advertising campaign now in progress was reviewed by P. Howard Farley, NECA sales promotion manager. He said that a good business potential exists but the market will differ from that of the past. Contractors must take smaller jobs to maintain volume. This type of market presents a greater opportunity



FROM NEW ENGLAND for the District One meeting of NECA were M. H. Heyman, Heyman Electric Co., Inc., Springfield, Mass.; W. L. Phair, William L. Phair & Son, Pittsfield, Mass.; and Albert Frank, Eastern Electric Co., Boston, Mass.



J. W. FORMMER, L. K. Comstock & Co., Inc., New York City; H. A. Webster, T. Frederick Jackson, Inc., New York City; and William A. Collins, Collins Electric Co., Springfield, Mass., attended the NECA District One meeting at the Lake Placid Club, Lake Placid, N. Y.

for the individual contractor's salesmanship. He pointed out that industrial, commercial and residential electrical modernization work is what the contractor should go after.

"Pitfalls of Negotiation" was the subject of a talk by John E. Lynch, Labor Relations Counsel of Hancock, Dorr, Ryan and Shove, of Syracuse. Mr. Lynch cited case histories and pointed out some of the pitfalls to avoid in negotiating benefit plans.

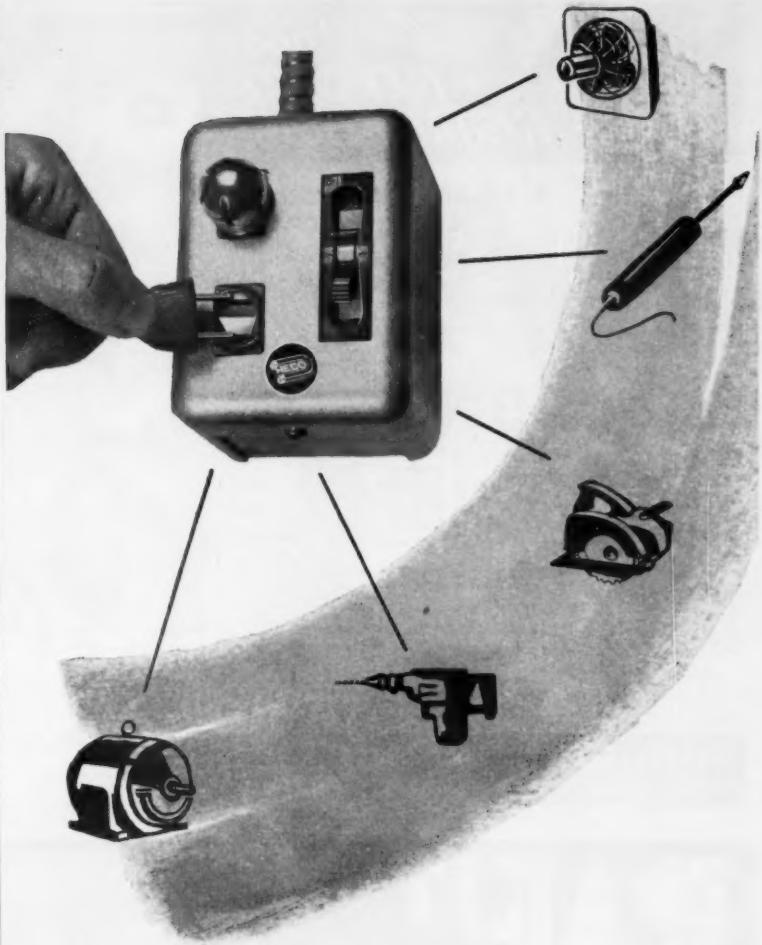
A report of the progress being made on the NECA-IBEW Joint Apprenticeship program was presented by Bill Damon, director of Apprenticeship Training. John L. Rose, manager of NECA Research, spoke briefly on "Operations Overhead".

At the forum on Saturday morning there was a lively discussion on the topics presented by the speakers on the previous day. Ray J. Knoblock of Syracuse acted as moderator. Also present at the forum to answer questions was Wilfred D. Howell, executive secretary, National Electrical Benefit Fund, Washington, D. C.

The governors, chapter presidents and managers held sessions on Thursday, and the meeting concluded with a banquet on Saturday evening.



L. I. WALDMAN, L. I. Waldman & Co., Inc., Long Island City; Louis Freund, New York City; and Meyer Bank, Bank Electric Co., New York City at Lake Placid Club.



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Safelets are safe outlets for power tools, soldering irons, exhaust fans, oil burners, air conditioners and miscellaneous small appliances. Installed in your plant, they can save many hours of down time, many dollars in equipment repair and replacement costs.

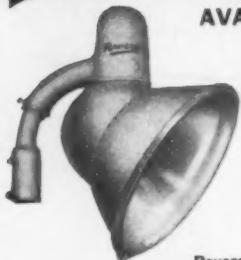
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ON ELECTRICAL SAFETY team at Grand Forks, North Dakota are: (L to R) Kenneth C. Lowe, member of the N. D. State Electrical Board; and electrical contractor Elmer Iverson.

Copper Industry Meets With BDSA

Representatives of every segment of the United States copper industry, including association executives, met in mid-June with Department of Commerce officials in Washington, to discuss the broad field of government-business relationships. This conference was sponsored by the Business and Defense Services Administration, and was the 23rd in a series of such meetings held in recent months.

The conferees were informed that it is the intention of the Department of Commerce to make more effective the voice of business in the councils of government. They were invited to present to BDSA and its 25 industry divisions any suggestions they wished to offer by which the Department of Commerce could provide more effective services to business.

A discussion of activities of the agency in connection with the mobilization of industry for defense was led by BDSA administrator Charles F. Honeywell. He stressed the importance of individual company actions which must be taken, as an important part of the total mobilization program, to prepare for continuity of production under actual attack conditions.

BDSA officials informed the copper industry representatives that the agency's defense and mobilization activities have reached an advanced stage of progress, and continuing studies are under way on possible deficiencies of industrial capacity. It was emphasized that, so far as the copper industry is concerned, no such deficiencies have been found.

The copper industry was commended for its leadership in the investment of private capital in foreign countries by a commerce official during a discussion

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BERNARD EICHWALD, president of B. Eichwald & Co., Inc., electrical engineers and contractors of New York City, has recently completed the electric and electronic work involved in converting New York City's old 81st St. Theater to a new modern CBS color television studio.

on some aspects of mineral policy which relate to foreign economic policy. Pointing out that some countries depend on one industry to provide major support for their national economy, this official expressed the hope that the United States and its private industries can help to broaden the industrial base of such countries. Such a broadening would serve to lessen the dependence of a country on a single industry and protect it against severe fluctuation in the price of a single commodity, he said.

Spokesmen for the BDSA Copper Division told the conferees that the Division is preparing a comprehensive quarterly report containing data on all phases of the copper industry. First issue of the report, which is being financed by the brass and bronze ingot makers, is due out in August.



INDUSTRIAL WIRING, both new construction and rewiring, is a specialty with Dickey Electric Co., Ft. Worth, Texas, directed by Arthur S. Harris (above), president.



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S. H.



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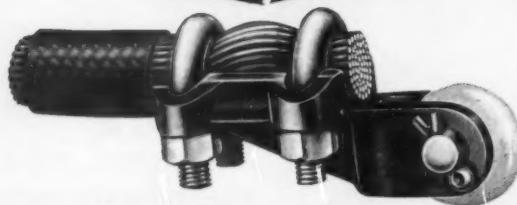
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MANUFACTURERS OF EFFICIENCY ELECTRICAL DEVICES FOR CONDUIT, WIRE AND CABLE SUSPENSION



EXECUTIVE HUDDLE at Don Blackburn & Company, Detroit, gives motor repair shop supervisor Ed Burke and president Don Blackburn chance to review operational techniques and blueprint ways of improving customer service.

Westinghouse Show Features Modernization

A new traveling sales show, "Chain Reaction", is Westinghouse Electric Corporation's answer to a common present-day problem: When should an industrial or commercial electrical distribution system be modernized? It was given its New York premiere showing recently before a group of some 300 electrical contractors, electrical distributors, members of the trade press, and others.

This new show, a blending of colored movies and slides on a panoramic screen with two-directional sound by the Transfilm audio-visual system, is a two-hour combination stage and screen production and presents a challenging story of electrical modernization and men and their mental attitudes toward this modernization.

The show strikes at the practical heart of the problem of achieving lower unit cost production in manufacturing plants, and maintaining competitive facilities in commercial buildings.

This show, aptly titled "Chain Reaction", is the story of a tool works



RESIDENTIAL WIRING is a big thing these days to Carl W. Nussbaum, whose firm, C. W. Nussbaum Electric Co., is working one of the large-scale housing projects in the New Orleans, La., area.



ELECTRICAL CONTRACTORS from Massachusetts—Bill Balcom from Malden and Jack Reddington from Boston—got together at Salem before an Essex County Electrical Club meeting to swap some amusing reminiscences of former meetings of electrical groups.

president who faces a dilemma: Should he sit tight because business is slow, or should he modernize the electrical distribution system to cut losses due to breakdowns and resulting high maintenance? It emphasizes the chain reaction effect on other local businesses of his decision to modernize.

Jointly sponsored by Westinghouse, its distributors and electrical contractors, "Chain Reaction" will be presented to factory and office building owners and managers in nearly 100 cities across the country during the last half of 1954.

NISA News

Metropolitan New York Chapter met at the Hotel Shelbourne on May 20th. The New York City meeting was presided over by the newly elected chairman, H. Engelmann. Reports were heard from L. D. Kennedy, secretary, who read minutes of last meeting; W. Leirer, treasurer; A. Shovan, program chairman; S. Bojak, Membership Committee chairman and W. J. Prise, chairman of Publicity Committee.

After dinner the main speaker for the evening was Sam Heller of American Rectifier Corp. Sam, well known in the industry for his outstanding work in engineering matters in NISA, is also chief engineer of Consolidated Electric Motor Company, and he gave a very interesting and enlightening talk on selenium rectifiers and their various applications in industry.

• • • •
Central District Chapter meeting May 11th at The Tower Club, Chicago, offered a most interesting program feature describing how "Big Business" gets big and explaining how little busi-



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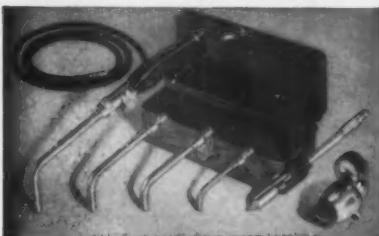
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GET IT FROM YOUR LINDE JOBBER

The term "Prest-O-Lite" is a registered trade-mark of Union Carbide and Carbon Corporation.



JOB SUPERINTENDENT Sidney Bennett of Walter J. Barnes Electric Co. checks over some details in the shanty at the Desire Street housing project, New Orleans, La.

nesses get bigger through a process of elimination. George Stanton, Personnel Counsellor, Reynolds Metal Company, pointed out some of the means employed by big companies in maintaining throughout their organization progressively higher-efficiency production and profits.

On Tuesday, June 8th, members of the Los Angeles Chapter met at Rodger Young Auditorium, Washington Boulevard, Los Angeles. All non-members, wives, and friends were invited to participate in a visit to the Kaiser Steel Company in Fontana on Tuesday, July 20, 1954, at 7 pm. Dinner will be served in the Kaiser cafeteria at 6:15 pm. It was suggested that the ladies attending wear slacks.

Cyclo-Freez Corp. has changed its address to P. O. Box 6, Minneapolis 16, Minn.

Thomas M. Paul, Paul Electric Co., Sioux City, Iowa, was elected by members of Region 11 to serve the unexpired term of the late William H. Guthrie, Omaha Electrical Works, Omaha, Neb.

Joseph H. Preuity, Penn Electric Motor Co., Philadelphia, has been named by Quaker City Chapter, host to the 1956 NISA Convention, to the post of General Convention Chairman.

"We can sum up the NISA emblem in three words," says A. C. Marks, Universal Electric Service, Chicago, in a letter to National Headquarters.

"It's a 'symbol of confidence' not only to the customer but to the supplier also," Marks writes.

From Walter J. Prise, The Maintenance Company, New York, N. Y.

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DATES AHEAD

Western Plant Maintenance Show and Conference — Pan Pacific Auditorium, Los Angeles, Calif., July 13-15.

International Association of Electrical Inspectors — Eastern Section, Atlantic City, N. J., August 30-31; Southwestern Section, Elko, Nevada, September 13-15; Northwestern Section, Portland, Ore., September 23-25; Western Section, Louisville, Ky., October 11-13; Southern Section, Tampa Terrace Hotel, Tampa, Fla., October 25-27.

Illuminating Engineering Society — National Technical Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., September 12-16.

Canadian Electrical Manufacturers Assn. — Annual meeting, Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, September 22-24.

International Association of Electrical Leagues — Bellevue Stratford Hotel, Philadelphia, Pa., September 29-October 2.

Eastern Canada All Electrical Show — Show-Mart Exhibition Hall, Montreal, Quebec, Canada, October 6-10.

American Institute of Electrical Engineers — Fall general meeting, Morrison Hotel, Chicago, Ill., October 11-15.

New Jersey Council of Electrical Leagues — 18th annual convention, Hotel Ambassador, Atlantic City, N. J., October 15-16.

National Safety Congress and Exposition — Conrad Hilton Hotel, Chicago, Ill., October 18-22.

National Electrical Contractors Association — Annual convention, Jung Hotel, New Orleans, La., October 27-30.

National Electrical Manufacturers Assn. — Haddon Hall Hotel, Atlantic City, N. J., November 8-11.

American Institute of Electrical Engineers — Winter general meeting, Hotel Statler, New York, N. Y., January 31-February 4.

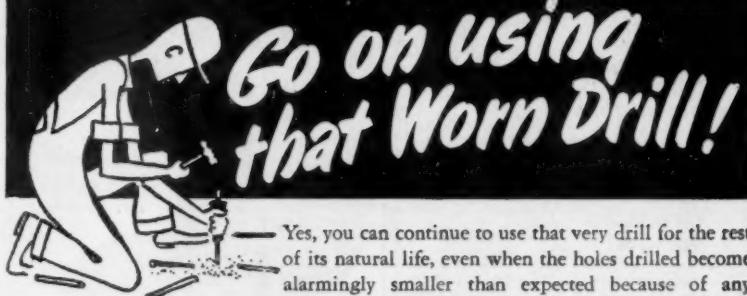
National Rural Electric Cooperative Assn. — Annual meeting, Atlantic City, N. J., February 14-17.

National Electrical Manufacturers Assn. — Edgewater Beach Hotel, Chicago, Ill., March 13-18.



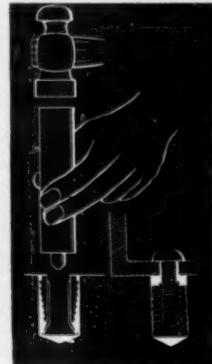
ELECTRICAL KNOW-HOW is the stock-in-trade of Frank Prattini, manager of electrical engineering and contracting operations of Brignac Electric Co., New Orleans, La.

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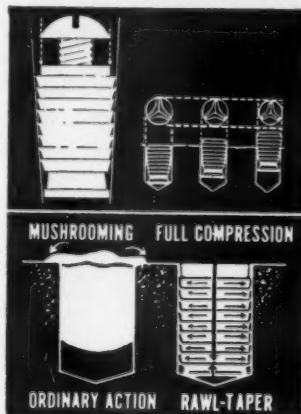
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...to overcome the tendency of lead to cling to the surface of the hole and mushroom, which builds up resistance and limits the depth of caulking between the nut and masonry.

...to avoid increasing the diameter of the lead which would require a larger diameter hole and in turn would reach the minimum limit when too small to receive the nut.

...to eliminate the poor practice of increasing the thickness of the lead sleeve beyond a certain ratio in proportion to the base diameter of the nut, which would be drawn up through the lead as soon as the anchor received any strains beyond the normal elastic limit of the lead.

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Headquarters Announcements

American Machine & Foundry Co., New York—E. H. Weitzen, vice president, marketing; R. W. Kerr, divisional vice president, General Products Group.

Remington Corp., Auburn, N. Y.—Frank A. Mitchell, general sales manager.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—T. G. A. Sillers, chief engineer, switchgear dept.

Pacific Coast Engineering Co., Alameda, Calif.—C. H. Ramsden, chairman of the board; Will C. Hall, president and general manager; C. D. Ramsden, vice president and chief engineer.

BullDog Electric Products Co., Detroit, Mich.—H. C. Egerton, treasurer.

Harnischfeger Corp., Milwaukee, Wis.—Oliver Fuller, sales manager for P & H electrical equipment.

Simplex Wire & Cable Co., Cambridge, Mass.—J. E. Auchmoody, comptroller.

TelAutograph Corp., New York, N. Y.—R. J. Keller, executive vice president.

Electric Regulator Corp., Norwalk, Conn.—W. Hamilton Walter, sales manager.

Stewart-Warner Corp., Chicago, Ill.—Bennett Archambault, president and director.

Markstone Manufacturing Co., Chicago, Ill.—M. S. Field, sales manager.

Dryomatic Corp., Alexandria, Va.—W. W. Bolton, president.

Fairbanks, Morse & Co., Chicago, Ill.—R. H. Morse III, assistant to the vice president in charge of sales.

H. K. Porter Co., Pittsburgh, Pa.—has acquired the Pioneer Rubber Mills Inc. of Pittsburg, Calif.

American Gas & Electric Service Corp., New York, N. Y.—Harold Turner, executive vice president.

General Electric Co., Weathertron Dept., Bloomfield, N. J.—William B. Hall, manager of product planning; W. G. Cox, manager of sales and distribution planning.

Penn-Union Electric Corp., Erie, Pa.—Dan E. Dunne, president.

Anderson Brass Works, Inc., Birmingham, Ala.—R. D. Cleaves, general sales manager.

General Electric Co., Lynn, Mass.—William J. Fleming, general manager of Rectifier Dept.; L. Byron Cherry, general manager of Outdoor Lighting Dept.

Graybar Electric Co., New York,

N. Y.—L. W. Taylor, general power apparatus and outside construction sales manager; A. J. Haeger, rural lines sales manager.

Regional Appointments

NEW ENGLAND

Robertshaw-Fulton Controls Co., Fielden Instrument Div.: Lawrence C. Connolly, manager of Boston sales office.

United States Steel Corp., American Steel & Wire Div.: F. T. Clarke, district sales manager, office in Boston.

Sylvania Electric Products Inc.: C. H. Emerson, sales manager of national accounts for New England; Walter Howard, New England district sales manager.

MIDDLE ATLANTIC

Oster Manufacturing Co.: T. E. Scanlon, sales representative for northern New Jersey; A. R. Pentz, sales representative for W. Va. and sections of Pennsylvania and New York.

Minneapolis-Honeywell Regulator Co.: Merritt Eusey, manager of Pittsburgh, Pa. office; R. S. Warnick, branch manager in Baltimore, Md.

SOUTH ATLANTIC

Wagner Electric Corp.: new branch offices and warehouse opened in Atlanta, Ga.

Minneapolis-Honeywell Regulator Co.: Donald H. Hannasch, district manager at Greensboro, N. C.

EAST CENTRAL

KSM Products, Inc.: R. H. Sawyer, district sales engineer at Birmingham, Ala.

Gray Manufacturing Co.: E. H. Whitlam and John J. Slattery, branch managers for Michigan and Ohio.

Oster Manufacturing Co.: D. R. Blanchard, sales representative for Wisconsin and Illinois.

Federal Electric Products Co. and Pacific Electric Mfg. Corp.: R. L. Bobo, Great Lakes regional manager, offices in Cleveland, Ohio.

Norris-Thermador Corp.: T. A. Linthicum, district sales manager for Ohio.

Okonite Co.: Dewey A. White, district manager of new office and warehouse opening in Birmingham, Ala.

Sterling Electric Motors, Inc.: Joseph H. Fallon, Cincinnati district sales manager.

WEST CENTRAL

Line Material Co.: William E. Bracey, central division manager.

Minnesota Rubber and Gasket Co.: Curtis Beem, Jr., Missouri district sales manager.

Oster Manufacturing Co.: George H. Filgo, sales representative for Louisiana, Texas, Oklahoma and Arkansas.

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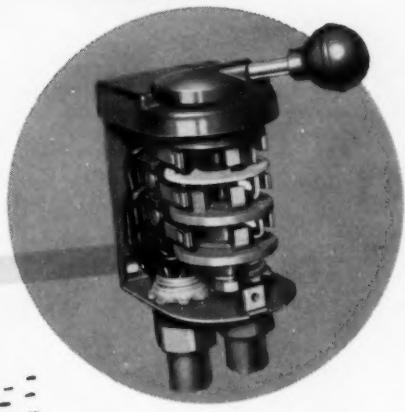
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• These manufacturers advertised their products in the ELECTRICAL PRODUCTS GUIDE

For more complete information, and application data on their lines, refer to the Index of Advertisers in the ELECTRICAL PRODUCTS GUIDE . . . the 13th issue of ELECTRICAL CONSTRUCTION AND MAINTENANCE.

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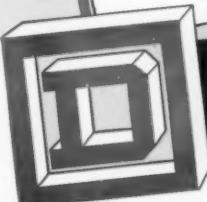
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